THE

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ELECTRICITY AND FIRE-DAMP.

THE New Coal Mines Bill now before Parliament reached the report stage on Friday, the 24th ult., when the now notorious clause suggested by Sir A. Markham when in Committee—that no electricity should be used in any mine, or part of a mine, where ½ per cent. of fire-damp was present—was discussed, and, we are glad to say, on the motion of the hon. baronet himself, amended. It is true the discussion was mainly one-sided, and by gentlemen both honourable and worthy, we admit, but the speakers had little or no knowledge of coal mining, and very much less of the nature or application of electricity. We say one-sided because throughout the whole of the discussion on this question, both in Committee and in the House of Commons, the dominant note has been the thunder of Sir A. Markham, who seems to have terrified the Government into meeting his views on this point, and it is, without doubt, representations from the coal trade that have influenced the hon. baronet to alter his ½ per cent. to 1¼ per cent.

The discussion was opened by Mr. Newman, who moved (see *Times*, November 25th) to omit Sub-sec. 2, Clause 59, which provides that "if in any place of a mine or part of a ventilating district of a mine the amount of inflammable gas in the air currents exceeds ½ per cent., the use of electricity *shall be at once discontinued until* the air current is clear of the gas, or the amount shall not exceed ½ per cent." The italics are ours and we shall refer to these later on. Mr. Newman contended that in "providing for the safety of the miners they ought not to forget other interests," which, to say the least, was very unhappily expressed, as the Mines Bill is designed exclusively for the greater safety of workmen in mines, and quite rightly no other interests can possibly be considered; the electrical engineering industry would be the last to suggest that their interests be considered when dealing with such an important question as the safety of the workmen. Mr. Gordon, who seconded the amendment, was equally unhappy in his statement to the effect that "he had received a representation from men employed in an electrical establishment in his constituency which paid £10,000 in wages, that this sub-section would be destructive to their interests." We, in fact, are sincerely sorry that any such representations were made, as however unintentional it may have been, they betray a thoughtlessness that is not consistent with the electrical industry. Had representations been made to the effect that the clause was based upon mismanagement and cheeseparing on the part of colliery managers and owners; cutting prices and bad workmanship on the part of contractors; and very much exaggerated fear on the part of the workmen, they would have been much nearer the mark, and the two members of Parliament might have had sufficient information placed at their disposal. This, backed up by examples of accidents taken from the reports of H.M. Inspectors of Mines, together with a few instances of where electricity has been the means of cheapening the production, increasing the wages, and lessening the more arduous labour of the miner,

would have enabled them to completely rout Sir Arthur and give the Government a very hard nut to crack. As it was they played directly into the hands of the hon. baronet and provided him with capital to further his own view, and eventually the amendment was withdrawn. At the same time, however, we must give credit to Messrs. Newman and Gordon for their kindly intentions, which would undoubtedly have been productive of better results had they been more conversant with the subject they had in hand.

In opposing the amendment, Sir A. Markham said "any man who took electricity into a mine where more than 1¼ per cent. of gas was present was mad." A few weeks ago it was ½ per cent. What, we wonder, has induced Sir Arthur to alter his opinion? He also said "there was no such thing as a *gas-tight* motor, but there were *flame-tight motors* in which, although an explosion might take place in a motor, *it was not communicated to the outside atmosphere.*" Well, what more is required? It has never been suggested—so far as we are aware—that an explosion in a mine could be initiated by anything else than *flame*, and if the motor can be made flame-proof, *in case* an accident should cause an explosion in the interior, which, we believe, is so far absolutely unknown to have occurred, why should anyone hesitate about taking electricity into a gassy mine? Another statement by the hon. baronet was that "Every Inspector of Mines regarded the advent of electricity into mines with the greatest alarm, and that alarm was shared by the miners." With the latter we agree, but we do not agree that they are competent to form an opinion, and in proof of our assertion, we may mention that, during the previous day's discussion, there was considerable bickering—in which the hon. baronet took a prominent part—because the miners objected to the use of safety lamps being made compulsory. On this point, we may mention what we believe to be a fact—that the men originally objected to electricity in the pit not so much because they looked upon electricity as something to be afraid of, but as an excuse to get naked lights introduced in place of safety lamps. They said, as electric motors which emit sparks—the first electro-motors in mines undoubtedly did spark—are allowed down the pit, why should we be obliged to work with safety lamps? Hence, we think we are justified in our statement—and we think Sir A. Markham, in his heart, will agree with us—that the men are not competent to judge; and as regards the opinions of the inspectors, their alarm is more apparent than real, and their objections are more academic than practical.

Sir Arthur, however, had the support of the Government, and in spite of one or two very reasonable suggestions and opinions put forward that the best thing to do would be to omit the sub-section and deal with the matter by regulation, the amendment, as already mentioned, was withdrawn, and Sir Arthur Markham's amendment to substitute 1¼ per cent. in place of ½ per cent. was adopted, and with this alteration the clause is embodied in the Bill.

As to the danger of electricity igniting fire-damp, we have on many occasions pointed out that with reasonable precautions and competent supervision the risk of personal accident is very remote, and the risk of igniting fire-damp practically infinitesimal. Not a scrap of evidence can be adduced—except in the wilfully-perverted minds of the miners' representatives and others who want to believe—that electricity caused either the West Stanley or the Hulton colliery disasters, and not a single accident due to electricity, either personal, fire, or ignition of fire-damp, has yet occurred which could be taken as an example to prove the opposite. The most dangerous instrument in the pit to-day is the ordinary oil safety lamp, and this danger would be removed if electric safety lamps were introduced. It is just as reasonable to enact that no timber shall be drawn in the "face" because it might result in an accident, as it is to debar the use of electricity for the same reason. Electricity has proved to be the most useful agent ever placed at the disposal of the miner, and we have little doubt that its usefulness will become more and more recognised; as time proves that with first-class plant and competent supervision accidents can be avoided, the present panic fear will pass away, and eventually all hampering restrictions will be removed.

We are in some doubt as to the correct interpretation of the clause as it stands, but there is no doubt whatever that the intention of Sir Arthur Markham was to prohibit absolutely the use of any electrical plant in any mine, or part of a mine, where the percentage of gas exceeded 1¼ per cent. If this is the correct interpretation it will involve very considerable hardship upon many colliery owners, as they will—unless it is possible so to arrange the ventilation that the gas is always diluted to this quantity—be obliged to pull out their present plant. On the other hand, turning to our italics, the clause reads, "The use of electricity shall at once be discontinued until the air current is clear," and if we may substitute for "the use of electricity," "the working of electrical machinery," and for "discontinued" the word "stopped," the clause becomes "the working of electrical machinery shall be at once stopped (and the men withdrawn) until the air-current is clear of the gas," &c., which makes it much more reasonable, and one which, in conjunction with the words regarding the withdrawal of the workmen, few people would cavil at. Under the proposed new electricity rules the use of electricity is to be "prohibited in any part of a mine where on account of the risk of explosion of gas or coal dust such use would be dangerous to life." Judgment on this point is left to the inspector, and any difference of opinion between inspector and owner is to be settled by arbitration.

It is, however, interesting to refer back to the report of the Departmental Committee who drafted the proposed new Rules and note what they say with regard to this question. They say:—"The Committee know of *no place below ground* in which electricity is in use to-day where both kinds of accident (viz., risk of ignition of explosive gas, &c., and risk of electric shock) *would not be avoided* if the best present-day practice as regards construction and maintenance were complied with," and further on the Committee practically apologise for the prohibition rule when they say:—"The existing rules do not prohibit the use of electricity in any part of a mine, whatever the working conditions may be, but as it *is difficult absolutely to ensure continuous and universal compliance* with the best present-day practice, the Committee are of the opinion that there are parts of some mines from which electricity should be excluded. The daily or frequent occurrence of inflammable gas in *any place in quantity detectable by the ordinary safety lamp* in use at the mine would make that place one to which prohibition should apply." Here the Committee think electricity ought to be excluded, not because in itself it is dangerous, but because the danger lies in carelessness in installation and management, as we have so often contented. Further, it will be noticed, the word "quantity" is very indefinite, and the question is left for settlement between inspector and manager. Now, however, this quantity is definitely fixed, and, reading the two rules together, we have the actual prohibition of electrical machinery in any part of a mine where "the daily or frequent occurrence of inflammable gas exceeds 1¼ per cent."

In face of this we are afraid electricity will receive a severe set-back, as far as the present development in coal mines is concerned, but we are also confident that it can be only for a time, as electricity is too useful and too economical in power transmission to be dispensed with, and even yet there may be embodied in the Bill a clause giving the Home Office authority to make new regulations, or to remove old restrictions if these bear hardly on the industry or even on individuals. But in spite of all opposition and ill-advised mischievous legislation, we are convinced that the development of electricity in mines will continue to progress, and it is to the advantage of the miner himself no less than to the owner and the community at large that this should be so.

THE INDUSTRIAL SITUATION.

The trend of events in the industrial world during the year now rapidly drawing to a close has belied the optimistic forecasts made during the earlier months.

It was confidently anticipated that after the years of depression, industrial conflict and unrest through which not

only we, but other countries had passed, the tide had, at last, turned, bringing with it the promise of a period of prosperity, industrial content, and commercial peace.

There were, however, not lacking those whose past experience caused them to fear that as soon as the wheels of trade tended to accelerate, the demands of labour would act as a dynamic brake and counteract the forward tendency. But the most pessimistic among them scarcely anticipated that the brake would so nearly bring the machine to a standstill as recent events have proved.

We need not here refer in detail to the labour disputes which have arisen during the year in various sections of our national industry, not only in manufactures such as the cotton spinning, coal and iron trades, but also in those trades concerned with electrical distribution and passenger transport, for the outstanding feature which almost brought the industrial machine to a standstill, viz., the great railway strike, has overshadowed everything else, and the shadow has not yet entirely passed away.

One very disquieting feature of the situation at present is the lack of authority on the part of the recognised leaders of labour. Whilst capital and labour are divided, as at present they are, into two hostile camps, it is an essential to the success of any negotiations between the two rival forces that the leaders should be able to count on the loyalty of the rank and file of their followers. Unfortunately this loyalty does not exist.

In addressing the shareholders of Richardsons, Westgarth and Co., Lord Furness said that the responsible leaders of the workmen had not only lost authority, but that "they lack sagacity and wisdom; and from one cause and another—perhaps because they have given more attention to politics than to business—their strength has departed, their power has been dissipated, and the clamour of inexperience and irresponsibility overwhelms everywhere the dictates of common sense." Proceeding, he said, "The need of the moment is a leader of labour—a man of the acutest insight, of wide and clear vision, and of cool judgment. Failing the speedy appearance of such a man, one can look forward to the future only in the spirit of the gloomiest anticipation."

Referring to strikes and their effect, Lord Furness pointed out that in connection with the shipyards controlled by Richardsons, Westgarth & Co., 30 per cent. of the 52 working weeks during this year had been affected by strikes, whilst holidays, sickness and miscellaneous lost time, accounted for another 10 per cent. During the whole of this disturbed or ineffective period—40 per cent. of the entire year—the establishment charges went on as usual. "The imperative necessity of keeping abreast of the times, technically, commercially and industrially, brings the establishment costs of an engineering business to a higher point every year. Development is so continuous and so rapid as to demand the services of a highly-trained technical staff that cannot in wisdom be disbanded during temporary slackness or a temporary cessation of work from any cause, whilst on the commercial side, those modern conditions which render necessary a large and expensive selling organisation at all times, make such an organisation imperative when orders are scarce, if any proper share of available work is to be secured."

It is obvious that these necessary and continuous expenses, which must form a serious burden to an industry during the best of times, must press with exceptional severity during times of slackness or enforced stoppage of work, and under these conditions may quite easily turn what might have been a profit into a certain loss. Unless, then, some marked change in the relationship of capital and labour can be brought about, by which a continuity of work shall be assured, it is not to be expected that men who have money to invest will risk it in enterprises which are at present so full of strife and uncertainty. To quote again from Lord Furness's address: "We are approaching the point when capital will refuse to respond, in adequate measure, to the ever increasing demands of progressive manufacture, and at that point decadence begins."

There is, however, another factor to consider when discussing the apparent decline in the prosperity of the engineering industry, and that is the lack of co-operation among engineering manufacturers—a want which tends more and more to a state of ruinous beggar-my-neighbour competition. Whilst this state of things lasts there is bound to be labour trouble. When orders for engines, turbines or electrical machinery are secured simply by cutting down the price in order to undersell some other manufacturer, and when the buying departments of these competing firms find themselves up against the combinations of merchants or manufacturers of the raw material necessary for the production of the machinery, who decline to imitate this insane policy, and insist on a fair and reasonable price for their goods, it is obvious that, if the cost of material and standing charges cannot be reduced, someone or other has got to suffer for it.

If, under these circumstances, labour strikes against a reduction of wages, what is the shareholder to do? He can only strike by declining to invest any more money in such a profitless industry; and without the shareholder—who is the hated capitalist—business will very soon come to a standstill.

Work and Wages.

A striking lesson in political economy was inculcated only the other day in the Court of Appeal—*apropos* the coal trade. It is a principle, however, which applies with equal force to any industry. It came out in the course of a case under the Workmen's Compensation Act, 1906, that the general effect of the Miners' Eight Hours Act had been to lower wages throughout the Welsh coalfield. No doubt the colliers who loudly acclaimed the measure when it first became law had been taught to believe that they would get the same wages for eight hours' work as they formerly received for nine; but notwithstanding the boasted strength of the trade unions this belief has been utterly falsified How long will it take to teach the proletariat that an advance in wages or its equivalent—a reduction in working hours—cannot be secured unless a number of conditions are fulfilled? As Mr. Cairns wrote in his "Principles of Political Economy": "An advance in wages may be effected in certain departments of industry by the action of trade unions where this is accompanied by an equivalent fall in others; and supposing the workmen in such departments of the industry had it in their power to exclude the competition of outsiders, it is quite possible that an advance of wages so effected might be permanently maintained." Was it explained to the miners that they must "exclude the competition of outsiders" before they could hope to gain any permanent benefit? The lesson might be inculcated by comparing small things with great. Suppose the labourer who cleans up at a generating station were to claim an advance in wages. What would be the reply of his employers? "If we put up a notice in the window, there will be a hundred applicants for your job to-morrow. You must take the wages you are earning or else clear out." All the trade unions in the world cannot raise wages even in skilled employments above a certain market value. In this connection the address of Mr. T. Harding Churton to the Yorkshire Local Section of the I.E.E., of which we give an abstract on a later page, will be found of interest.

The I.E.E. Articles.

As will be seen elsewhere in our pages, the discussion of the proposed new Articles by the Local Sections, in the presence of the leading members of the Council, has been steadily carried on during the past fortnight. We cordially agree with Mr. Ferranti and other members of the Institution that, after all, the error of judgment on the part of the Council in the first instance is likely to prove in the end of

great advantage to the Institution, for never before in our experience has the whole body of members, down to the Students, displayed so keen and individual an interest in the welfare of the society. Doubtless the fact that the pocket is touched has been a material factor in arousing the members to action; but as we have pointed out on previous occasions, the initial stimulus was certainly a feeling of irritation at the seemingly high-handed action of the Council. Frank acknowledgment of the mistake, and the ample amends which have followed, have gone far to dissipate that feeling, and the local conferences which have been held have been free from the "asperity," to use Mr. Trotter's apt expression, which characterised the first meeting.

While London is necessarily the headquarters of the profession, the centre of gravity of the industry is certainly nearer Lancashire, and without quoting the hackneyed proverb, we attach great weight to the views of the Manchester Local Section. As will be seen, the Committee of the Local Section very carefully deliberated upon the proposals and formulated a series of suggestions which bears witness to the earnestness and broad views with which the subject has been approached. The proceedings at the conference, conducted by the chairman, Mr. W. Cramp, were also most systematic and businesslike, comparing favourably with the procedure at some of the other centres.

The Manchester members gave their approval to the proposal to increase subscriptions, but qualified it with the recommendation that differentiation be introduced not only between London and provincial members, but also between those who are within range of a Local Section and those who are not. Mr. Pearce's suggestions regarding the mode of election of the Council were also useful. They embody a condition which we advocated in our issue of November 17th—namely, that the number of names on the ballot list shall always exceed the number of vacancies, so as to ensure that there must always be a real election, not a mere acquiescence on the part of the members. We do not suppose that a Council chosen by any of the systems of popular election which have been proposed would be one whit more efficient than the Councils of the past and present—that is not the point; the one essential condition is that the members must feel that it is a Council of their own choice, and we are confident that when the revised version of the new Articles appears, it will be found to contain suitable provision to this end.

The Manchester Students also have taken vigorous action, which we feel sure will not be ignored by the Council, though the proposal to appoint Student Delegates to confer with the Council seems rather unnecessary. Surely the Committees of the Students' Sections can keep the Council fully informed as to the needs and wishes of their members. Amongst minor points not mentioned in our report was a request that the age limit for studentship (26 years) be re-inserted. As we have already pointed out, this provision has never been cancelled—being now embodied in Article 17.

While there is at present no power to submit important questions to the members by a postal referendum, it would certainly seem advisable that some such provision should be made, for it is clearly a sore point with many of the provincial members that they are unable to vote on such matters without incurring the expense and inconvenience of the journey to headquarters.

The Council is still at a loss for a name for the class of "Licentiate," that title having clearly been condemned on all hands. We once more urge the claims of "Junior Member" for the class in question; it adequately describes the member, is incapable of abuse, and offers no inducement to its owner to "stick" in the class—while at the same time there is nothing objectionable in the title. It should, of course, not be used in any abbreviated form, for it expressly implies not the possession of technical qualifications, but the reverse, the class being primarily intended as a half-way house between Student and Associate Member.

The term "Graduate," which essentially implies that the owner has completed a course of instruction and has qualified for a degree, is obviously and entirely inapplicable to a class of members whose distinctive feature is the fact that they have *not* attained that position; "undergraduate" would be a less misleading description, but neither term is appropriate when removed from its academic associations.

The London Electric Supply Act.

The proceedings of the L.C.C. during the past week or two have been of more than ordinary interest, in view of the attention directed to the position created by the London Electric Supply Act, 1908.

This Act, it may be remembered, facilitated the making of agreements for mutual assistance between authorised undertakers within the Administrative County of London, and transferred to the Council the power of purchasing the company-owned supply undertakings in London in 1931, or at subsequent dates.

So far as actual results are concerned, the permissive powers of this Act have for the most part been ignored, and it is high time that the County Council, if, indeed, it has any intention of exercising its future powers of purchase, and thus becoming the principal authority for electricity supply, should go thoroughly into the whole question of the means to be employed, and obtain financial security and unity of purpose in the future.

While we quite appreciate the businesslike policy which has been adopted by some of the supply authorities in London, even the best of them cannot under existing conditions be expected to look beyond their own boundaries—in fact, there is no obligation on them to do so.

For this very good reason we trust that the Council will make full inquiry into the existing conditions of electricity supply, and that the difficulties, real and imaginary, which stand in the way of anything like concerted effort on the part of the various authorities, will be fully discussed.

We very much doubt whether any coercion which the Council may be able to exercise will appreciably help towards the great end in view—an end, which in our view, would mark the real beginning of commercial electricity supply in London.

The A.E.G. General Meeting.

The general meeting of the A.E.G. in Berlin, on November 21st, was the first occasion in recent years, if not in the history of the company, when any information has been officially given concerning the profits realised on the sale of securities, and the proportion of such profits devoted to depreciation of machinery and plant other than the comparatively small sum actually shown in the annual accounts. In reply to questions, Herr Rathenau stated that including the balance brought forward from 1909-10, the security account yielded £456,000, the syndicate account £66,300, and interest £61,700, making a total of £584,000. This sum was disposed of by placing £334,000 to the depreciation account and carrying forward the balance of £250,000. Referring to the turnover in 1910-11, which was not specified in the annual report, the speaker remarked that the reason the figures were not given was not because they were specially low, but because they were extraordinarily high, and might lead to erroneous conclusions, and unfavourable comparisons next year. The works were now employed to the maximum of their capacity, and a large increase could only be expected when the extensions in progress were completed. Subject to this reservation, it was mentioned that the value of the total turnover at the chief works and branches amounted to £15,300,000 in 1910-11, as compared with £12,600,000 in the preceding year, whilst the orders on hand on September 30th, 1911, reached £18,100,000, as contrasted with £13,500.000 on the corresponding date in 1910. It was added that the augmentation in the turnover should not lead to unjustified expectations in reference to future financial results, as the profits were not according to the volume of business, but were largely determined by selling prices. The latter exhibited a tendency towards a slight improvement, although they could not be regarded as satisfactory.

THE NEW WORKS OF THE FOSTER ENGINEERING CO., LTD.

The development of the Foster Engineering Co. from a small private firm to a prosperous limited company with a flourishing manufacturing business, in the course of a comparatively short period, is a striking illustration of what can be done even in this country, in the face of keen competition, by dint of unflagging industry and good management on sound business lines. It is by no means a unique instance, however, of the fact that a small undertaking, in which the directors are personally engaged, and over which they maintain direct supervision, may be conducted with very great efficiency and economy, and may thus be enabled to compete with large establishments in which it is impossible for the directors to fulfil the functions of management and supervision without delegating a large part of their duties to others, with the result that, unless highly competent and conscientious managers are employed, various forms of loss are inevitably incurred.

Eight years ago we paid a visit to the works of Messrs. Foster & Co. at Worple Road, Wimbledon, to inspect the now well-known hot-wire lamp which was patented in 1901, and which has since been manufactured and sold in great numbers—being largely used, for instance, by the Post Office on A.C. circuits at the present time. The lamp was described in our issue of July 31st, 1903. Since that date continual progress has been made, and the firm have successively taken up the manufacture of various patterns of open, enclosed and flame arc lamps, transformers, and metallic-filament lamps.

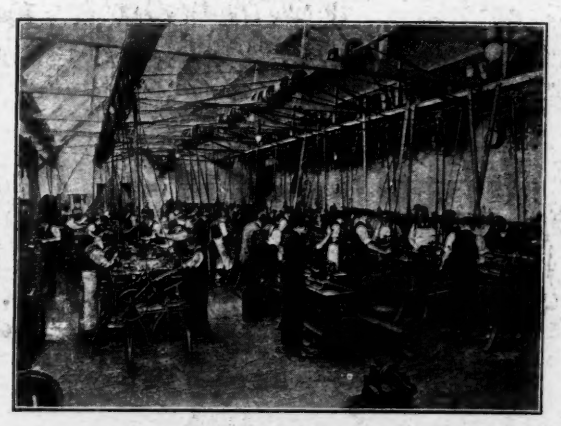
The business was converted into a limited liability company in July, 1907, under the title of "Foster Arc Lamp and Engineering Co., Ltd." A notable event took place last year, when the business of the Brockie-Pell Arc Lamp Co. was acquired, and the manufacture of the lamp associated with that name—one of the oldest, most reliable, and most widely known types of arc lamp ever put on the market—was vigorously undertaken, the name of the company being at the same time changed to "Foster Engineering Co., Ltd."

These various developments — especially the growth of the metallic-filament lamp business —naturally entailed expansion of the manufacturing facilities, and in August last year a new building erected by the company at

Portion of Metal Lamp Pump Room.

Lamp Sealing Department.

Machine Shop.



Arc Lamp Assembling.

Coil Winding Shop.

The Foster Engineering Co.'s Works, Wimbledon.

D

Morden Road, Wimbledon, was occupied, the whole of the works and offices being transferred to that site. The new factory is of one storey throughout, and has been designed on the most modern lines, ensuring ample lighting, ventilation and accessibility. The site is 3½ acres in area, of which 1 acre has been covered with buildings; but when we visited the works some time ago, the need for further extensions had already been felt, and two new bays were under construction. We are informed that even now there is insufficient accommodation to meet the growing demand for the products of the works, in which 300 hands are employed.

We give herewith a few illustrations of the interior of the new works, showing some of the departments. Perhaps the most important of these is the metal-filament lamp factory, which at present has a capacity of about one million lamps per annum. All the plant used in connection with this factory is made in the company's own workshops, and we believe other lampmakers have come to the Foster Co. for certain appliances. The pumping apparatus, which in a tungsten lamp factory is of even greater importance than in a carbon lamp works, is of the most up-to-date design. A feature of the "Foster" metallic-filament lamp, to which special attention has been given, is the strength of the filament, and we understand that in this respect the lamp has proved exceptionally satisfactory.

Searching tests are applied at every stage of the manufacture of the lamp, and during the exhaustion of the bulb the lamp itself is kept in a state of vibration, so as to ensure that only the fittest shall survive. After the lamp has been pumped, sealed and rated, it is put on a two-hour test, and after completion it is again tested before being wrapped up. A special method of packing is also employed, which has proved effective in reducing the percentage of breakages in transit to a trifling amount, although a large proportion of the lamps are exported to China, Australasia and South America.

On the introduction of the low-voltage tungsten lamp, the company took up with energy the manufacture of auto-transformers, making it a speciality. Contrary to what might be supposed, in view of the development of the high-voltage lamps of small candle-power, the sale of these auto-transformers is still increasing, and they are at present being turned out by the company at the rate of no less than 12,000 a year. Quite recently the design has been materially improved, and the price reduced, the no-load losses being brought down, for instance, to 10 watts in the case of a 1,000-watt 200-25-volt transformer, and 5 watts in the case of a 250-watt transformer for the same ratio. The coils are fireproofed by a special process, and carry heavy overloads for long periods quite safely. These are, perhaps, the best-known of the Foster manufactures. Large transformers are also made, and the company is making a special feature of their manufacture in all types and sizes.

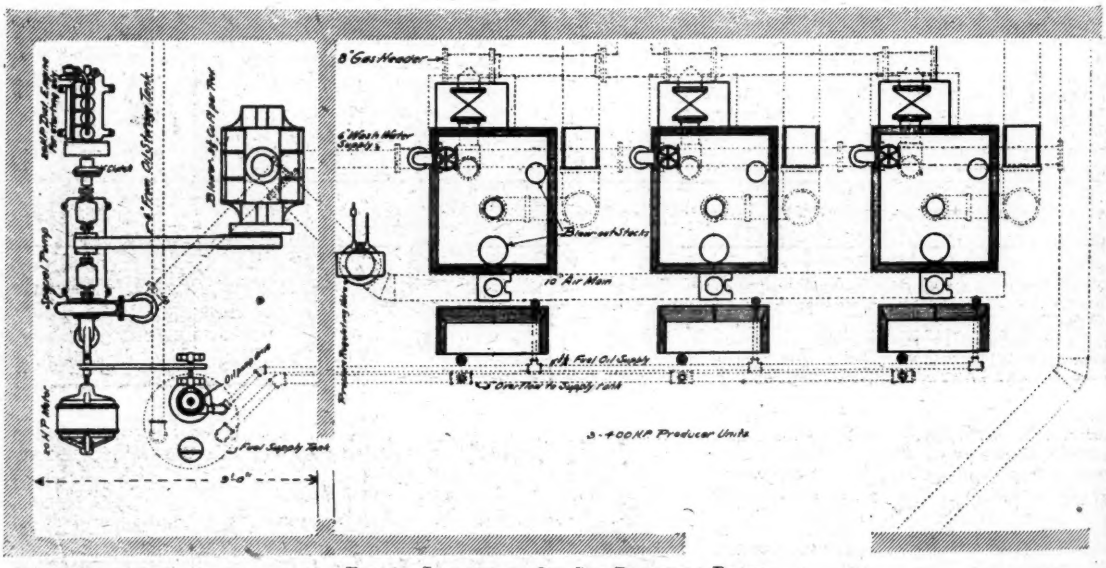
The arc lamp department is capable of an output of 300 lamps a week, and facilities are provided for testing lamps and other apparatus at the actual voltage and frequency on which they will be run. Besides over 300 corporations in the United Kingdom which use the Foster arc lamps and transformers, many of the principal railway companies, the Post Office and the Admiralty are customers of the company. The "Q" flame arc lamp, which we described some two years ago, is noteworthy for its long burning hours, due to the use of a special multiple carbon patented by the company, with low carbon cost.

Having an extensive equipment of modern tools, the company also undertakes general mechanical engineering work.

It will be seen that in the course of its development the company has extended its interests in various directions, and apparently with invariable success, a continuance of which, we trust, will attend its further operations.

THE UTILISATION OF CRUDE PETROLEUM FOR ELECTRIC POWER PRODUCTION.

THERE have been numerous attempts, some of them very successful, to utilise crude petroleum as a means of obtaining mechanical and electric power, but for the most part the energies of inventors have been directed towards the direct use of the crude oil in special forms of gas or oil-vapour engines. Another department of activity in which considerable progress has been made, however, is that involving the previous gasification of the crude oil in some form of producer, the gas then being drawn to a gas engine adapted to the requirements of the fuel supplied. The problem of making producer gas from crude petroleum, comparable with that obtained from coal, and especially adapted, by automatic control of both quantity and quality, for use in gas engines, has been exceedingly difficult of solution, but is of great interest to engineers on account of the important reduction in cost of power to be thereby obtained. This problem has now apparently been solved, and it is our purpose to describe an important equipment installed by the International Amet Gas Power Co., of Los Angeles, California, in the electric power house of the Holton Power Co., at El Centro, California.


8' Gas Header
6" Wash Water Supply
Blower-set Stack
10" Air Main
4" Fuel Oil Supply
3" Drain Pipe to Supply Tank
3-400 H.P. Producer Units
Fuel Supply Tank
Oil Heater
Blower-set Oil Pipe Line
Air Line
Fuel Oil Pump
Water Pump
Engine Exhaust Pipe
Producer Gas Line
Engine Cooling Water Pipe
Engine Jacket Water Pump
Engine Cooling Water Tank
Engine Jacket Water Tank
Engine Cooling Water Pump
Engine Jacket Water Pipe
Engine Cooling Water Pipe

Distillates such as gasoline and kerosene, which are free from asphaltum, have, therefore, been the only available fuels for direct engine use, and the consequent enormously extensive introduction of the distillate engine, notwithstanding its high cost of operation, is well known. The successful gasification of crude oil results in putting that material on a practical parity with distillate in the production of power, with the resulting saving of the large difference in cost, which is approximately 75 per cent. It also makes possible a saving in fuel cost over steam plants of approximately 50 per cent. The thermodynamic efficiency of the vapours from distillate, gasoline, &c., in a gas engine is low, on account of their high explosiveness, which causes pre-ignition, thus limiting compression to so low a value that it requires about 20,000 B.TH.U. per brake H.P.-hr., while the slow burning producer gas will use only 9,000 or 10,000 B.TH.U. per brake H.P.-hr., or an increase of utility of 50 to 55 per cent. Up to within a very recent period the only gas produced from crude oil has been a gas having a value from 550 to 680 B.TH.U. per cb. ft., used for domestic lighting and cooking. This gas has been produced by the process known as the "cracking" of the crude oils, which is largely disruptive in effect, and frees a very large percentage of hydrogen and carbon, resulting in a gas carrying 50 per cent. and upwards of free hydrogen. This gas will give no higher efficiency in a gas engine than the distillate above referred to. The system to be described generates a gas that has more than 70 per cent. of its heat units in hydrocarbon gases, a small quantity of carbon monoxide and free hydrogen makes it possible to run the compression up to the limits of good engine construction, and as the economy of a plant is in a measure proportionate to the compression allowable, it is probable that this gas may result in the highest possible economy that may be obtained in a gas engine suitably designed. The most advantageous value of this gas is between 200 and 250 B.TH.U. per cb. ft., depending on the character of oil used. It may be adjusted, however, anywhere between 170 and 270 B.TH.U. The following analyses illustrate its character :—

B.TH.U.	267	225	210
CO_2	4·2	5·4	6·5
O	0·2	·3	·4
CO	8	8·6	7·8
Cn H_2n	2	4·2	4
CH_4	16·2	7	6·0
H	12	10	9·8
N	57·4	64·5	65·5

One of the greatest difficulties in the operation of oil-gas producers has been the control of the value of the gas for all conditions of load. In the producer to be described it is accomplished by automatic means by keeping the oil at a fixed temperature to maintain a constant viscosity, and providing for an absolutely proportionate quantity of oil to be carried along with whatever volume of air is forced into the producer. The proportions of air and oil are adjustable and under the control of the operator, but after any particular adjustment is made, the load can be varied from one-fourth to fifty per cent. over full capacity, and the value of the gas will remain constant for all practical purposes. The economies resulting from this system, when compared with distillate engines or steam power plants, are exceedingly interesting to the user of power for any purpose. Constant operation is practicable at loads ranging from 30 per cent. of full capacity to 50 per cent. over the normal rated capacity of the producer without serious change from the maximum economy. In the large units steam is introduced by automatic means to raise the economy and maintain the best operating conditions, with the result that the Amet-Ensign oil gas producer, in combination with the high-efficiency producer gas engine, has been found to develop very great economy. A number of operating runs have been made producing 8 B.H.P.-hrs. to the gallon, and further tests made on low-gravity oil from 12° to 16° Beaumé indicate that, under proper operation, as high as 10 to 12 H.P.-hrs. may be expected from a first-class well-designed engine combined with this producer. Tests have also been made with oils from which the gasoline and distillate have been removed, which proves that this form of fuel can be used to excellent advantage.

The illustration, fig. 1, shows the lay-out of the gas-producer equipment at El Centro, from the dimensions of which the great economy in space, as contrasted with a boiler-house design for the same power, will be apparent; producer plant of 1,200 H.P. divided over three units, and including producers, pipework and auxiliary apparatus such as blower, pumps and motors, is housed in a space of approximately 512 sq. ft. The oil is stored in a concrete tank, and is led as required to the producers by pipework. The producer, shown in fig. 2, is a very simple and distinctly unique apparatus

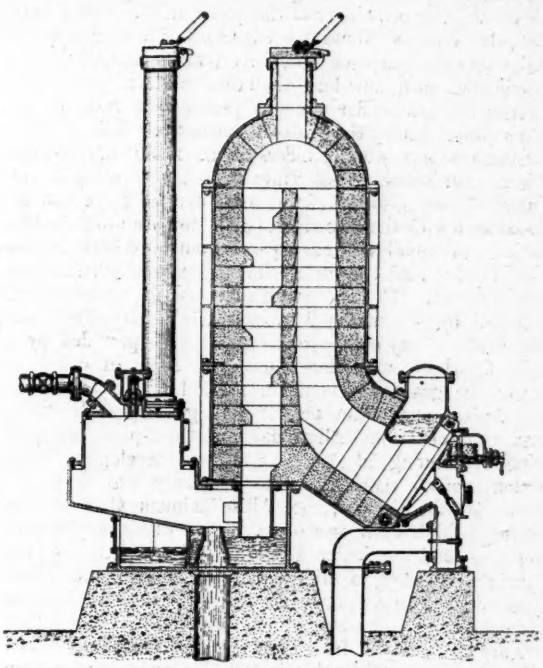


FIG. 2.—SECTION OF OIL-GAS PRODUCER.

for the conversion of the crude oil into gas. The operation consists of a sustained combustion carried on in a furnace of a peculiar and definite form of construction, the air and petroleum uniting in such a manner as just to distil the higher constituents of the petroleum away from the air, and consume the heavier constituents—such as asphaltum—to produce the heat for carrying on the process. This is all accomplished in an open combustion chamber free from baffles or checker work. An extension to the combustion chamber, called a combining chamber, is sinuous in form, so as entirely to mingle the vapours and the dissociated products of combustion for finishing the gas-making process, the passage for the gaseous products being perfectly clear, with air entering at the extreme lowest portion. This form of construction ensures an absence of clogging of the producer with deposits of carbon in any form that cannot be easily removed by the simple operation of shutting off the oil for very short periods of time, and allowing the air only to pass through the producer, this constituting what is known as a "burn-out." During this period the gas is furnished by a small gasholder. The duration of the burn-out is, at most, but 10 per cent. of the total time of the operation.

Thus, it may be seen that this producer is quite distinctive in its construction and operation. The washing apparatus is extremely simple, operated on the rotary or centrifugal principle at a moderate speed by the force of the applied wash water. Its simplicity permits operation for an indefinite period without attention or repairs, and prevents clogging or fouling in any manner. A pressure blower capable of furnishing air under 1 lb. pressure, in volume about equal to one-half the capacity of the producer, a centrifugal pump furnishing water under a pressure of 100 ft. head, a small geared oil pump, all driven from the main engine, and a gas holder of small capacity for equalising the gas pressure and automatically regulating the rate of make of gas to meet the demand, are installed. These auxiliaries require about 2½ per cent. of the capacity of the producers. All parts of the producer are readily accessible. The design and construction of the entire apparatus has proved to be

such that, with constant operation for four years on other similar installations, practically no repairs have been necessary, except the renewal of a few fire bricks, and in view of the fact that the plant shows no deterioration, the original efficiency will probably be maintained indefinitely. The depreciation on a plant of this character is, it is claimed, much less than that of a steam plant. The producer itself, being made of cast-iron, which is in the form of a case, holding brickwork, is subject to no wear and tear. The remainder of the plant will have the same wear and tear as would be expected of any plant for similar uses and purposes. In three years' operation there is no indication as to how long the brick will last.

From the gas holder the gas passes to a 700-KW. gas engine unit built by the Allis-Chalmers Co. This is of the twin-tandem type with cylinders 21 in. × 30 in., provided with a compressed-air starting device. The cylinders, exhaust valves, pistons, piston rods, and all parts coming into contact with the hot gases of explosion are water-cooled. The inlet valves allow of the separate control of both the gas and the air, the mixture being thus properly proportioned to meet the load. The valves are automatically operated and controlled by a centrifugal governor, belt-driven from the main shaft. Very close speed regulation is provided by a 15-ft. fly-wheel, weighing about 16½ tons, in order to operate the gas engine unit in parallel with both hydro-electric plant and steam plant. The gas engine drives by direct connection an Allis-Chalmers three-phase 60-cycle alternator running at 150 R.P.M., and developing 2,400 terminal volts. Owing to the relatively high hydrogen content of the oil gas, the Allis-Chalmers Co. are not carrying as high a compression as is used with gas produced from coal, and particular attention is being given to the proper water cooling of all the parts which come into direct contact with the hot gases. To this end specially designed water-cooled igniters are provided. Apart from this detail, there are no variations from their standard practice.

It will be seen that this installation opens up a very important field of development. In the producer gas engine, using either bituminous or anthracite coals, the washing problem has not always been solved to the very best advantage of the engine, resulting in the rapid wearing-out of valves, piston rings and cylinders, or a continual annoyance from sticking of the valves due to tar and other ingredients, causing frequent shut-downs and numerous repairs. With this producer process, experiments have been made allowing quite a perceptible amount of finely divided carbon, which is in the gas before washing, to pass the washer with absolutely no damage to the engines or interference with the operation. Naturally, from an oil fuel there are no ashes, and this process properly operated will produce absolutely no tar. Engines have been operating on this system for four years, and it is claimed that no pre-ignition has ever occurred, the compression in the engine cylinders running as high as 190 lb. Not a single valve has been reground, or piston ring renewed, or anything done in repair to the cylinder or pistons, and the compression is still maintained at its original value. The renewal of igniting points on the engine and general examination of working parts have up to the present been the only reasons for shutting down. One great advantage of this process and a further economy is the instantaneous operation from cold plant. In warm weather, or by artificially heating the oil in cold weather to 100° temperature, it is stated that a producer can be put into full operation under full power in a minute and a-half to two minutes, the time necessary to start the auxiliary apparatus. The operation of such plants is exceedingly simple. They will only require the intermittent attention of the attendant, so that one man may operate a power plant up to 300 H.P., and if sufficient care is taken in laying out the plant, one man may operate a 500-H.P. plant. In fact, a large plant with a number of units can be made almost automatic.

The actual attention required is regular and no more than is given to a similar installation with a steam boiler fired with oil. Any single producer requires attention for three minutes every half hour; for the balance of the time it will take care of itself much better than a steam boiler fired with oil, for it will absolutely follow the load, which a boiler cannot be expected to do. The gas has a heat value of from 180 to 270 B.TH.U. per cb. ft., and unlike other processes, there is a minimum of lampblack produced, and the gas is easily washed to any degree of freedom from such matter. The technical interest of this development is, therefore, not confined to California, but will be of value to electrical engineers wherever crude oil can be obtained at a cheaper price than steam coal.

CORRESPONDENCE.

Letters received by us after 5 P.M. ON TUESDAY *cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.*

The Institution of Electrical Engineers.

During last week's discussion at the I.E.E. one speaker said: "We stand as a learned society; as one of the scientific societies of the century." This is illuminating; one had not thought of the Institution in quite that light. However, it is evident that the reforming fever is in the air, and general opinion favours change.

From the discussion one learns that it is proposed: To establish five classes of membership; to admit legal and commercial persons of eminence connected with the industry to a special class; to institute an entrance examination; there are other questions, but the three foregoing have the widest interest. The first and second proposals are interdependent, as a class is to be reserved for non-engineers; but it is not clear that non-engineers will be satisfied with the provision made for them.

If it is really desirable that every person connected with the electrical industry should be a member of the I.E.E., the inducement to join must be considerable.

Assuming the five classes and the relative numbers and composition of each to be:—Fellows (engineers), 10; Members (engineers 30, non-engineers 10), 40; Associate Members (engineers), Associates and Students, 50, it would clearly be much to the advantage of every engineer, lawyer and commercial person interested in the electrical industry to become connected with the Institution—an Institution well-balanced and representative.

There does not appear to be any necessity for an entrance examination; already there is quite a large number of engineering examinations available, from London B.Sc., which should satisfy anyone, down to B. of T. "chief's," which, I am told, confers a variety of weird powers and benefits on the happy holder. At the same time, there is no reason why Associate-Membership should not be made a guarantee that a person is a "duly qualified engineer." If an entrance examination is instituted it will be at least 10 or 15 years before this effect can be produced. If, on the other hand, all Associate Members, not engineers, were transferred to the Associate class and all future candidates required to submit a detailed statement of experiences, give references and be interviewed by a Selection Committee, membership of this class would almost immediately be accepted as due qualification.

With all the opinions provided by Press and local centre discussions before them, the Council will be in a position to formulate a scheme of revision that will place the Institution on a sound basis and thus confer lasting benefit on the electrical industry.

J. F. D. Hale.

Liverpool, *November 28th*, 1911.

Perhaps you will allow me space in your valuable paper to express an opinion upon the new Articles of the I.E.E. As a sales engineer and manager and one considering the question of making application to the I.E.E. for membership, I have followed with interest the accounts printed of the various discussions and views expressed. Possibly I may not be entitled to offer any opinion at the present time, but I venture to think that there are many men placed in the same position as myself to-day and who would make application to join the I.E.E. providing, by so doing, they could be assured of the advantages appertaining to the Associate Member. I consider

Mr. Ferranti is right in suggesting the policy of broad-mindedness, as it is, in my humble opinion, essential for the welfare of the electrical industry as a whole, that both the technical and commercial sides should be welded together as one.

After carefully studying all the available opinions, I, however, am forced to the conclusion that those people who at the present time are engaged on the commercial side of the industry are to be relegated to a class by themselves together with members of the legal profession, commercial and financial; quite right—but what about the commercial engineers—men who have served their time in the shops, and afterwards held engineering positions of responsibility, and who later on have gone over to the commercial side? Are these men to be classed in a grade lower than the Associate Members, and not to be allowed the same status? I am of opinion that if the I.E.E. were to make it clear that these men would be ranked equal to the Associate Member, they would then obtain a class of new membership which would in every way uphold the prestige of the Institution. With regard to the question of examination, I consider that your correspondent, Dr. Garrard, is quite correct in his views, and it is quite possible that commercial engineers of position will not submit to the indignity of entering for examinations.

L. G.

In connection with the proposed alteration of the Articles of Association of the Institution of Electrical Engineers and the increased subscriptions, it appears that the great objection to the increase of subscriptions is that corporate members are to have such a small return for their money. I assume that an increased subscription is necessary and desirable, and that everyone will wish to pay the same when assured of an adequate return. An adequate return can easily be obtained by raising the status of the corporate members, and this can be done by the Council obtaining power to take the necessary steps to have the Institution chartered on the lines of the accountants, the Institution to be then known as the Chartered Institution of Electrical Engineers and the corporate members as Chartered Electrical Engineers, or, for short, as Chartered Engineers. This would at once enable members when filling up legal documents, club membership application forms, &c., to distingnish themselves from electricians, wiremen, fitters, &c., who all call themselves electrical engineers or engineers. Why should this not be undertaken at once, or as soon as the examination scheme has been put in hand? No good purpose can be served by waiting for the other two great engineering institutions to make a move. Unless they are forcibly aroused by the Institution of Electrical Engineers taking the necessary steps they are likely to remain in the same state of somnambulism as the Institution was in until Mr. Ferranti took it in hand.

In conclusion, I would point out that anything that raises the status of the corporate members must be of lasting benefit to the science and industry which supports the Institution, and without which it could not exist.

Norman R. Corke.

South Croydon, *December 4th*, 1911.

In your issue of December 1st, your report of the proceedings of the meeting of the Yorkshire Local Section, which was held on November 20th, to discuss the proposed new Articles, states that a resolution was put to the meeting without the consent of the chairman. Will you please correct this misstatement. The resolution in its amended form was, in fact, accepted by me and put to the meeting from the chair.

T. Harding Churton,
Chairman, Yorkshire Section.

Leeds, *December 4th*, 1911.

Two-wattmeter Method of Measuring Power in Three-phase Circuits.

There is one important extension of this method which has not been considered in your article of last week under the above title. This is the method of obtaining power factor by the ratio of wattmeter readings.

Consider the testing of an induction motor. Within a very small percentage the phases are balanced, so that for all practical purposes I (the current) and θ (the angle of lag) are the same in each phase. It then follows that—

$$\frac{W_2}{W_1} = \frac{\cos(\theta + 30)}{\cos(\theta - 30)},$$

and if a standard curve of values of cos θ be plotted against this function—

$$\frac{\cos(\theta + 30)}{\cos(\theta - 30)},$$

then the value of cos θ = power factor may be read off for any observed ratio of W_2 and W_1.

If θ be taken as rising from 0° to 90° (the limits of an induction motoring current), the corresponding values of the ratio will be found to vary from + 1 through zero to − 1. For currents in the other quadrants the same curve will serve, it only being necessary always to take the ratio of the smaller reading to the larger.

One further simplification is possible in practice.

The normal connections for this method may be taken to be, for leads A, B and C :—

1. Current coil in A, volt coil A to B.
2. Current coil in C, volt coil C to B.

Since the circuit is balanced, the latter reading is obviously equal to either—

3. Current coil in B, volt coil B to A ; or
4. Current coil in A, volt coil A to C.

Hence, readings 1 and 4 give the same result as 1 and 2, or it may be said—

The current coil is left permanently connected in circuit A, and the readings taken with the volt coil connected first across to B, and then across to C, the motor being of course in a stable condition while the readings are taken.

The curve of cos θ against the ratio W_2/W_1 is, of course, a standard, and, once drawn out, will last a lifetime.

An alternative method to the constant reference to the curve, which I have found extremely handy, is to draw a double scale of power factor (corresponding to the positive and negative limbs of the curve) on a slide rule under the slide. When the wattmeter readings have been obtained, it is only necessary to push the slide to one side, and then read the power factor direct from the ratio by looking down through the cursor.

This method saves considerable time when power factors are constantly being determined.

It must be pointed out that this means of obtaining the power factor is considerably more accurate than the standard watts/volt-amperes method, for in the latter, there are the errors of three separate meters to be reckoned with, whereas in the former, there is only the difference of error of two parts of the scale of the same meter.

Laurence H. A. Carr, M.Sc.Tech.

Birmingham, *December 4th*, 1911.

The article by Mr. Ogley on the measurement of three-phase power by the two-wattmeter method, has prompted me to send along a method of obtaining the power factor in a three-phase balanced circuit by means of a single-phase wattmeter and a simple calculation. This method occurred to me a week or so ago, and, so far as I am concerned, is original.

Let fig 1 represent supply leads, which are in connection with a star-connected source of supply, with the current coil of wattmeter inserted in A phase. The method consists of alternately connecting the pressure coil across A B and B C, and noting the readings on the instrument. Calling these R_1 and R_2, respectively, the power factor, *i.e.*, cos θ, may be found from the tables, after finding value for cot θ in formula—

$$\frac{\sqrt{3}\cot\theta - 1}{2} = \frac{R_1}{R_2}.$$

The proof is as follows :—

In fig. 2 let O A, O B, O C represent current in the phases.
,, ,, ,, O A_1, O B_1, O C_1 represent pressure in the phases at unity power factor.

IC As is well known, current and pressure differ by 30°. Suppose this angle be increased (fig. 2) by lag of $\theta°$ between

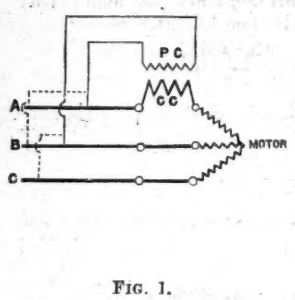


FIG. 1.

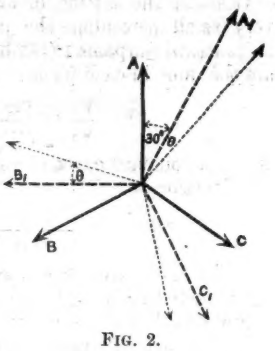


FIG. 2.

current and pressure. Each wattmeter reading equals $A \times V \times \cos \phi$.

Therefore, $R_1 = A \times V \times \cos (30° + \theta°)$,

$R_2 = A \times V \times \cos (90° - \theta°)$.

Dividing R_1 by R_2, this equals—

$$\frac{\text{Cos } (30° + \theta°)}{\text{Cos } (90° - \theta°)} = \frac{R_1}{R_2} = \frac{\sqrt{3}/2 \cos \theta° - \frac{1}{2} \sin \theta°}{\sin \theta°}.$$

$$= \frac{\sqrt{3} \cot \theta - 1}{2} = \frac{R_1}{R_2},$$

which is a form suitable for easy calculation.

If the reading R_2 is negative, power factor is leading.

W. F. Kearsley.

London, S.E., *December 1st*, 1911.

P.S.—To me it seems more practical to substitute R.M.S. values after establishing the vector proof, than to leave the formula in terms of maximum values, as in Mr. Ogley's article.

A Reliable Rectifier Wanted.

Having seen Mr. George Sutton's letter upon the above subject in the "Correspondence" column of your last issue, I feel that in justice to myself I should trespass upon your space again to further explain matters, although I am sorry that from private correspondence which we have had together, Mr. Sutton does not understand my reason for bringing up this subject. I neither had heard of Mr. Sutton in connection with "Batten" rectifiers before, nor did I aim at any one particular piece of apparatus, but by "Batten type" I referred to relay instruments as a whole. He is wrong when he states that I have not had experience with "the unit"; I actually purchased and used a genuine "Batten" rectifier some years ago, and although the maker himself came down several times, and attempted to make it work satisfactorily on the local supply, and provided me with sundry extra condensers, it would not work correctly throughout the day. The reason was attributed to the different characteristics of the generating plant supplying from time to time.

After a time I was able to dispose of the whole at a considerable loss to a motor engineer in another town, where it worked more or less satisfactorily on another supply company's mains. Mr. Sutton condemns electrolytic and vacuum rectifiers; but, owing to the publicity given the matter, I have been assured by the makers of these, contrary to my experience, that they are perfectly reliable.

My views are that the demand is for a rectifier that will work under the ordinary commercial conditions of a public supply, irrespective of the different characteristics of the generating plant that may be feeding the mains during the day. That the debated apparatus is found wanting in practice, is only proved by the number of such being replaced by small motor-generators at the present time, and by the number of the cheaper forms of instruments that are withdrawn from the market. I have no doubt that under ideal conditions all will behave well.

If I have unwittingly done your correspondent any harm in mentioning the name "Batten," I express my regret.

J. R.

ELECTRICITY AT THE NEW WHITELEY'S.

THE firm of Whiteley, in its association with Westbourne Grove, has been one of the most prominent factors in the London shopping world for many years. The passage of time, however, marks many changes, and it will not be surprising, in view of the palatial building—the new Whiteley's—which has been erected in Queen's Road, if "Whiteley's of Queen's Road" displaces the old-time association.

Messrs. Whiteley, of course, still retain extensive premises in Westbourne Grove, but the handsome adjoining structure which has made its appearance must necessarily eclipse the older shops.

Prior to the completion of the new building we were enabled, through the courtesy of Mr. W. Stewart, Messrs. Whiteley's engineer, to look over the electrical portion of the work.

The firm has for some years had its own generating plant, which, in addition to a new 200-KW. Belliss-Siemens set recently added, includes four 125-KW. Willans-Lahmeyer sets, and two 60-KW. Willans sets, all with compound engines and generating current at 200 volts pressure.

The plant has previously been called on to supply from 2,500 to 3,000 amperes at times of maximum load, and from 500 to 800 amperes day load, mainly for the numerous motors used in the various departments. Steam is supplied at 120 lb. pressure from six 30 ft. × 8 ft. boilers fitted with motor-driven machine stokers and Galloway superheaters.

The exhaust steam from the engines is passed through steam heaters, by the Atmospheric Steam Heating Co., for heating the buildings, and Webster feed heaters for the boiler feed.

An extensive switchboard is provided in the engine room, and from it two pairs of feeders run to the new building to two main distributing boards in the basement.

These boards, each fed by one pair of feeders, are situated in the basement of the nearest block to the engine room, and serve as the starting point of subsidiary feeders which run through the basements of the seven blocks into which the new building is divided, and feed a sub-main board in alternative blocks; the sub-main boards in the basements supply local lighting distribution boards on each of the four floors above, as well as one fixed nearby for basement lighting.

All the basement boards are of the Spagnoletti ironclad pattern; each main board is arranged for four 250-ampere circuits, one being spare, and fitted with switch-fuses and tandem knife switches on slate bases.

The sub-main boards are eight-way in each case, fitted with 50 to 100-ampere switch fuses on slate bases, while the local distribution boards carry usually seven 5-ampere ways. In the case of stair lighting, some of the lamps are run off each of the main circuits, with a view to avoiding total extinction of the lighting should one supply fail.

The wiring throughout is by means of Siemens 600 grade QR cable, rated on 750-ampere per sq. in., and run in solid screwed conduit, with iron boxes; the conduit is copper bonded to 3-in. cold water service piping and earthed at the sub-main boards.

At each iron distributing board the conduit is run through clearing holes in the case, a brass bush is inserted in the end of each tube, and a lock nut screwed down on to a spring washer outside the case, ensures good metallic contact.

The wiring throughout is on the loop-in system, and terminates in concealed metal boxes on which are fixed the bases for tumbler switches, ceiling roses, &c. Exterior wiring on fire stairs, &c., is run in screwed galvanised conduit.

A feature of the wiring in the shops is the use of Middleton patent distributing boards, in which each circuit is provided with enclosed fuses of ingenious design, and small tandem switches; the whole of the wiring work was carried out by H. J. Cash & Co., Ltd.

In the new building some 2,000 incandescent points are provided for, including 500 in the windows, where Siemens tungsten lamps with strip reflectors are employed all through for indirect lighting.

There are also 450 Brockie-Pell arcs (by the Foster Co.), and some idea of Messrs. Whiteley's total lighting requirements can be gathered from the fact that over 600 arcs and 7,000 incandescent points will be supplied from their private station.

A special power circuit supplies the motors in the new building, numbering about 40, and bringing up the total of motors in use by Messrs. Whiteley to over 100.

Amongst the various applications of power may be mentioned 16 large Waygood lifts, as well as some smaller ones; a parcel sorting and conveying plant by Messrs. Sauvée & Co., situated in a basement and in communication with each shop, also an escalator from the basement to the loading bank for dispatching goods by the firm's carts; three motor-driven turbine vacuum plants, which by means of pipe lines throughout the building, and detachable hoses, render cleaning a comparatively easy matter; a ventilating plant; a pneumatic tube installation, for conveying mail matter, orders, &c., between the counting house and the various shops; and refrigerating plants, both for the kitchens and for the storage of furs, many thousand pounds' worth of which are lodged with Messrs. Whiteley each summer for safe keeping.

One further prospective electrical feature is worth noting, although it has not yet taken definite shape, and that is a Marconi wireless telegraph installation which it is proposed to erect on the roof, for the convenience of customers from afar—one wonders how far!

A complete automatic sprinkler installation is provided to extinguish or help to extinguish fires, and to more completely safeguard the firm, an installation of Aero fire alarms is provided in addition.

LEGAL.

The Lot's Road Arbitration.—British Westinghouse Co.'s Appeal Dismissed.

On Monday, in the Court of Appeal, composed of Lords Justices Vaughan Williams, Buckley and Kennedy, judgment was given in the case of the British Westinghouse Electric and Manufacturing Co., Ltd., *v.* the Underground Electric Railways Co. of London, Ltd., on the appeal of the plaintiffs against the refusal of a Divisional Court (Mr. Justice Pickford and Mr. Justice Lush) to set aside an award of an arbitrator. The facts have already been fully reported in our pages.

Sir Alfred Cripps, K.C., Mr. Disturnal, and Mr. Tangye appeared for the appellants; and Mr. J. P. Fitzgerald, K.C., Mr. Roskill, K.C., Mr. A. B. Shaw, and Mr. L. Macassey for the respondents.

Lord Justice Vaughan Williams, giving judgment, said that in his opinion the words "reasonable and prudent" in the arbitrator's findings, meant, not reasonable and prudent as a matter of railway management, but a reasonable and prudent mode of avoiding the very heavy loss which might otherwise fall upon the plaintiffs, and that as between the plaintiffs and the respondents the purchase of the Parsons machines would not have been reasonable and prudent as a matter of mitigating the damages accrued if some other cheaper and better mode had been available for avoiding and mitigating the damages. He understood from the arbitrator's finding that no better mode was available for the mitigation of the damages for which the plaintiffs would have been liable in future. It seemed to him that if the railway company had not effected the purchase of the Parsons machines, it would have been a prudent course for the plaintiffs to have purchased such machines themselves, and have substituted them for their own machines; and in such an event they could no more have charged the railway company with that expense than they could have charged the railway company the money they expended in making alterations and improvements in their own machines in the hope of bringing those machines into conformity with the specification. The award, in his opinion, followed the directions given by the first Divisional Court, and that being so the appeal must be dismissed.

Lord Justice Buckley dissenting, said that it seemed to him that the Arbitrator's finding came to this: that the purchase of the Parsons machines by the railway company was reasonable and prudent, but that if there had been no breach of contract it would have been equally reasonable and prudent; nay more, that it would have been to their pecuniary advantage to purchase the new machines at their own cost. The course they took, therefore, was attributable not only to the breach but to considerations for their own pecuniary advantage. In his opinion, the appellants were entitled to have the view of the Arbitrator as to whether the purchase of the Parsons machines, of greater power, greater efficiency and longer life, was reasonably prudent for the purpose of mitigating damages apart from considerations of their own pecuniary advantage. For these reasons he thought that an error of law appeared on the face of the award, and that the award ought to be set aside or remitted for reconsideration. The other members of the Court, however, did not read the special case as he did, and in the circumstances he did not know, if he had adopted their opinion as to its meaning, that he would have differed from their conclusions.

Lord Justice Kennedy agreed with Lord Justice Vaughan Williams. He said he thought that if there was an error on the face of the award it was open to the Court to send the case back, but he was of opinion on the facts that there was no ground for allowing the appeal. In his view, the railway company availed themselves of the only course open to them to mitigate the damages, and the arbitrator's award gave the plaintiffs the full benefit of that mitigation. The award was not erroneous in point of law and the appeal must be dismissed.

By a majority of the Court, the appeal was accordingly dismissed, with costs.

F. A. Glover & Co., Ltd., *v.* Living Picture Palaces Co.

At the Bromley County Court recently, plaintiffs, electricians, of Clerkenwell, sued defendants, of St. James's Street, London, claiming £94 3s. for work done at the Palais de Luxe and goods sold and supplied. There was a counterclaim for £30 for damages for defective work. For plaintiffs it was stated that there was first a dispute concerning a small claim for extras which had to be added to the electric light fittings because certain alterations were made in the original building. Another point in dispute was as to the construction of the contract. Defendants wanted arc lamps, but, when the things came to be put in, the lights required ornamental brackets, and the question was whether they were entitled to the extra for them or not. On the counterclaim the defendants said that the work was defective in consequence of the negligent manner in which the wiring was done, allowing the damp to get in and cause fusion of the wires. They further complained that wooden terminal boxes had been used in a number of places instead of iron boxes. Plaintiffs admitted that in those places no iron boxes were used, and contended that they were not necessary. A good deal of evidence was given, and ultimately his Honour said that he would give his judgment at the next sitting of the Court.

BUSINESS NOTES.

Worthington Contracts.—The following are amongst recent orders booked by the Worthington Pump Co., Ltd., of London and Newark-on-Trent:—

One triple-expansion pumping engine complete with superheater for collier service in the North.

One outside packed compound plunger pump complete with surface condenser, vacuum pump, feed pumps, hydraulic air compressor, oil separator, &c., for railway service on the Continent. Also a compound piston pump for oil service on the Congo.

One surface condensing plant complete with Triplex air pump and centrifugal circulating pump for the Dunlop Rubber Mills, and one ditto with Simplex air pump and centrifugal circulating pump for the Coventry Corporation.

Two sets of low level jet condensers of the counter current type arranged with their patent electrically-driven horizontal rotative dry vacuum pumps and centrifugal pump for iron works in the Midlands.

One complete patent combination of air and centrifugal pumps for use in connection with a refrigerating plant, the installation being required to maintain a very high vacuum to reduce the temperature in brine reservoirs to the lowest possible extent.

Two electrically-driven low lift centrifugal pumps for Calcutta Tramways. Also one ditto of the vertical type for Manaos Tramways, being a repeat order.

Two low lift centrifugal pumps for Southend-on-Sea Corporation.

One horizontal high lift centrifugal boiler feed pump with alternating current motor for Ireland, through Messrs. Babcock & Wilcox, Ltd.

Besides the above a large number of orders have been secured for Worthington duplex pumps, including over 150 for marine service, also power pumps, vacuum pumps, air compressors, water meters, &c.

Diesel Engines for Electricity Works.—The Diesel Engine Co., Ltd., have received the following contracts for Diesel engines exclusively for electricity supply:—

Bath U.D.C. Electricity Works.—One engine 680 B.H.P.
Oxford Electricity Supply Co.—One engine 650 B.H.P.
Isle of Thanet E.T. and Ltg. Co.—One engine 600 B.H.P.
North Metropolitan E.P. Supply Co. (repeat order).—One engine 400 B.H.P.
Sheerness and District E.S. Co. (repeat order).—One engine 400 B.H.P.
Messrs. C. H. Walker & Co., Ltd.—Four engines 1,000 B.H.P.
Great Northern Railway Co. (repeat order).—One engine 420 B.H.P.
Punta Arenas Electricity Supply Co.—One engine 250 B.H.P.
General Electric Co., Ltd., of Australia.—Two engines 400 B.H.P.; one of 200 B.H.P.
Dacca Electricity Supply Co.—Three engines 350 B.H.P.
Messrs. Agar, Cross & Co., (for Argentine).—Four engines 650 B.H.P.
For the Canadian Government (repeat order).—Two engines 400 B.H.P.
Aldershot U.D.C. Electricity Supply.—One engine 200 B.H.P.
Bridgwater E.P. and Traction Co.—One engine 150 B.H.P.
Bangor Electricity Works.—One engine 140 B.H.P.
Bude Electricity Supply Co.—One engine 130 B.H.P.

In addition, they are supplying a large number of smaller sets in sizes ranging from 30 to 120 B.H.P. The majority of the above orders are for their latest type of Diesel engine which is specially designed to meet central station requirements.

Tube Platform Illumination.—The accompanying illustration shows Oxford Circus Station, on the Central London Railway, which is illuminated by means of 100-C.P. "Onewatt" drawn tungsten lamps in conjunction with suitable Holophane

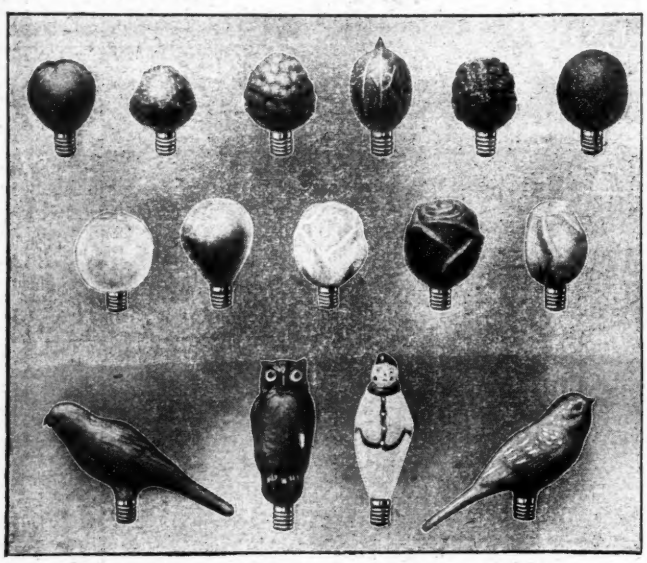
Tube Platform Illumination.

glassware. It will be observed that a very uniform platform illumination is obtained, the improvement being very marked in comparison with lighting by arc lamps on other tube railway platforms. This method is also interesting by reason of its great economy, the consumption of power being less than one-fourth the consumption with arc lamps. The scientific diffusion of the light, enables a lower candle-power unit to give adequate illumination in all directions. For instance, the Oxford Circus "Onewatt"

installation gives a practically uniform illumination of 4½ C.P.-ft. at a height of 4 ft. above the platform throughout its entire length. The illustration is reproduced from a photograph which has not been re-touched, and which can be seen in the offices of Messrs. Siemens Bros. Dynamo Works, Ltd., Tyssen Street, Dalston, London, N.E.

South African Trade.—We have several times referred to the efficient arrangements that are provided at the British Trade Commissioner's Office at Cape Town for imparting commercial information to local buyers concerning the trade of the United Kingdom, and to firms at home regarding South African trading opportunities, &c. We have now received from the office a printed list of the commercial and trade journals, trade and other Government reports and statistics, and other publications that are filed for reference. We are sure that nothing will please Mr. Sothern Holland better than for our firms to take the fullest possible advantage of these and other ways in which he and his staff are trying to further the interests of British traders in South Africa.

Christmas Decorations.—MESSRS. WARD & GOLDSTONE, of Springfield Lane, Salford, Manchester, have issued a list of their decorative lamps for bazaar and Christmas-tree illumination, shop-window displays, and other like purposes during the approaching festivities. The lamps, as the accompanying illustration shows, consist of tiny bulbs in the form of fruit, flowers, and figures in coloured glass. They are 14-volt carbon series lamps, and are supplied with lampholders as required, or ready wired complete. The firm has issued a priced circular regarding these goods.



CHRISTMAS DECORATIONS.

Dissolutions and Liquidations.—KEARNEY HIGH SPEED RAILWAY CO., LTD.—A petition for the winding up of this company has been presented by Messrs. Ransomes & Rapier, Ltd., creditors, and is to be heard in London on December 12th.

WAKELIN BROS., LTD.—A petition has been presented by J. F. Wakelin, electrical engineer, 4, Squires Mount, Hampstead, and E. Dixon, engineer, of Kentish Town, for the winding up of this company. It is to be heard on December 12th in London.

COWPER-COLES ENGINEERING CO., LTD.—It has been resolved to wind up voluntarily, with Mr. W. H. Peat, 11, Ironmonger Lane, E.C., as liquidator.

VAUGHAN, HUGHES & BATY, analysts, metallurgists and electrical engineers, 130, Edmund Street, Birmingham.—Messrs. T. V. Hughes & E. J. Baty have dissolved partnership. Mr. Hughes will attend to debts, &c.

Bankruptcy Proceedings.—W. R. N. GARD, electrician, West Ealing.—The public examination of the above debtor was held at the Court House, Half Acre, Brentford, on Tuesday last week, before Mr. Registrar Russon. It transpired that the debtor started business in 1903 at the Orchard Electrical Works, Canterbury, in partnership with another. In 1905 this concern was sold, and all the debts were paid in full. Debtor continued the business until December, 1906. Since he had known of his position he had incurred two further debts, but he was relying upon his earnings. The liabilities amounted to £283, and there was a deficiency of £276. The failure was attributed to want of capital and bad trade. The examination was formally adjourned for closing.

BERT NEWMAN (B. Newman & Co.), electrician, 4, Cranbrook Road, Ilford.—Receiving order made November 29th on a creditor's petition.

"A Reliable Rectifier Wanted."—Referring to the correspondence on this subject in our pages, the CRYPTO ELECTRICAL CO. put forward the claims of the A.C. to D.C. motor-generator. They have for many years manufactured a combined alternating to continuous-current transformer with outputs of 100 and 350 watts on the secondary, but from several remarks contained in letters they gather that what is required is a still smaller and consequently cheaper machine. They have, therefore, arranged to put on the market a combined alternating to continuous-current transformer which can be wound on the primary for any voltage and periodicity, and will give an output on the secondary of 50 watts, and expect to have this machine ready for delivery in about three weeks' time.

Meter Approved.—We learn that the E.A.C. high-torque meter of the ELECTRICAL APPARATUS CO., LTD., has been approved by the Board of Trade.

The Proposed Aluminium Syndicate.—The idea of resuscitating the former syndicate of makers of aluminium has by no means been abandoned, and a first conference of representatives of international interests was recently held in Paris. A definite result was, however, not reached. The discussion was principally concerned with the question of tonnage allotments in the syndicate, it being eventually decided to hold a further conference. In interested circles on the Continent it is considered that an understanding is now not out of the question. The situation of the aluminium industry is at present more favourable than in recent months, as the consumption has largely increased. It is also thought that the recent rise in the price of copper will favourably influence the use of aluminium, as the latter is frequently substituted for the former when copper advances in price. The quotation for the white metal has also risen on the Continent in the past few weeks, and is at about 1s. 2¼d. per kg., whilst, at the same time, producers are reserved in making offers.

Catalogues and Lists.—THE GENERAL ELECTRIC CO., LTD., 67, Queen Victoria Street, London, E.C.—New catalogue Section "S" (54 pages), containing fully-illustrated notices and prices of a large variety of electric lighting accessories. That the company has for a long time past devoted close attention to the production of a line of Home Office accessories specially designed to meet the requirements of the Electrical Inspector of Factories and Workshops, is a fact well known to our readers, and the manufactures of this class that are listed include distribution boards, shielded fuses, branch switches, wall plugs and adapters, factory plugs, cut-outs, "Coates" lampholder shields, and china lampholders. Other lines included, and calling for mention, are the new "Slick" flat switches which have met with an excellent reception; an improved line of wall plugs in three principal gauges—"Midget," "Standard," and "Union"—all plugs being interchangeable; plaster-lined cut-outs, the prices of which have been considerably reduced; and a new circular type of detachable fuse; while the other contents of the catalogue comprise distribution boards, strip lighting material, and advertising sign flashers—both motor-driven and "Thermic" types. All articles have catalogue numbers, and there are both general and numerical indices.

MESSRS. SCHAFFER & BUDENBERG, LTD., Whitworth Street, London Road, Manchester.—Three new descriptive price lists as follows:—Section 6 (24 pages) relating to their relief and safety valves; Section 19 (6 pages) describing their pulley block reducing gear and non-stop indicating gear; also Section 22 (4 pages) fully describing their patent "Concentra" oil pump.

THE BRITISH WESTINGHOUSE ELECTRIC AND MANUFACTURING CO., LTD., Trafford Park, Manchester.—The company has just issued a new binding case containing seven sections of its lists of electric lamps and lighting accessories. A thumb index guides the reader to the separate sections. The material is given very fully, is well arranged, and includes numerous illustrations, and, of course, detailed prices, but we think that there may be just a little too much in the case for easy handling for reference purposes. In our experience the most useful catalogue is one which does not require the aid of the hands to keep it open on the desk. We understand that other lists are in course of preparation for early issue, covering switch fuses, distribution boards, insulators, carbon-filament lamps, Holophane fittings, glass work, bells and telephones. Those already issued and included in the binder before us, cover the following manufactures:—No. 101/1—Arcturus lamps, standard and magazine flame, also enclosed types, including carbons, winches and accessories; No. 102—Auriga metal-filament lamps; No. 111—Electrical accessories of every description; No. 127—Trafford lanterns and weather-proof fittings, for offices, workshops, mines, docks, railway stations, and public street lighting; No. 136—Trafford conduit and fittings; No. 140/3—Ariel electric fans; No. 150—Electric heating and cooking appliances, including radiators, heaters, &c.

THE WOLSELEY SHEEP-SHEARING MACHINE CO., LTD., Sydney Works, Alma Street, Aston, Birmingham.—20-page illustrated catalogue showing their Wolseley electric motors, as employed for sheep-shearing and horse-clipping purposes. They have standardised a set of motors to work at 2,000 R.P.M., this being the highest speed desirable for horse-clippers. The motors are fitted with either flexible shafts or steel tubes, and are adaptable to any of their standard shears or clippers. The list also shows and describes electric sharpening machines, portable petrol-electric outfits and the Wolseley-Brewerton starter. Other lines are also included, and a couple of pages set out technical information. A separate eight-

page catalogue illustrates and briefly describes the Wolseley petrol engines.

MESSRS. LAING, WHARTON, LTD., 7, Great Newport Street, London, W.C.—This firm are the sole agents in the United Kingdom for Messrs. Vedovelli, Priestley & Co., manufacturing electrical engineers, of Paris, and they have issued an English catalogue of some 44 pages, in the course of which they give illustrated descriptive information and tabulated prices of high and low-tension switchgear, including "Robur" switches, high-tension oil-break switches and change-over switches, pole switches, high-tension isolation switches for interior and exterior service, "Robur" and "Carter" automatic circuit breakers, relays, fuses, switch fuses, lightning arresters, &c. We have also received a complete set of the Vedovelli, Priestley French catalogues. One of these is Part I of their catalogue of electrical apparatus; another is devoted to electric traction material for overhead and third-rail construction, signalling apparatus, &c.; while smaller publications relate to monolithic alabastrine panels, luminous letters for advertising purposes, electric fountains, &c. We understand that Messrs. Vedovelli, Priestley have been awarded two Grands Prix at the Turin Exhibition, one each in Classes 28 and 29, Group 5. They have carried out some large power transmission and railroad electrification schemes in France, and are just completing two sections of the experimental single-phase line which is being erected by the Chemin de Fer de Midi, the tests of which are to take place almost immediately.

THE WALSALL ELECTRICAL CO., LTD., 57, Bridge Street, Walsall.—Further advance leaflets, part of the firm's catalogue, have been issued giving brief illustrated information and tabulated prices of Walsall soft-iron meters, transformers, wire net resistance type board, circuit-breakers, master switches, special switchboards, &c. Copies can be obtained on application.

THE ELECTRICAL AND ENGINEERING SUPPLIES CO., LTD., 36 and 37, Upper Thames Street, London, E.C.—List showing a number of typical designs of electric signs (transparent box type), and illuminated wood letters, and giving prices of same.

MESSRS. FALK, STADELMANN & CO., LTD., 83-87, Farringdon Road, London, E.C.—Revised price list of "Efesca" metal-filament lamps, announcing further reductions in prices of low-voltage and high candle-power lamps.

MESSRS. SIMPLEX CONDUITS, LTD., Garrison Lane, Birmingham.—Mailing card making a special offer of electric advertising signs.

MESSRS. MAJOR & CO., LTD., Sculcoates, Hull.—Their new booklet, "The Manufacture of Insulating Varnish," contains a number of photographic views showing the firm's works, and describes the methods briefly. Copies may be had on application to the firm.

ELECTRICAL ENGINEERING AND AGENCY CO., LTD., 109-111, New Oxford Street, London, W.C.—Pamphlet describing and illustrating their type "L" high-lift centrifugal pump, the chief feature of which is a patent hydraulic balancing device.

The King's Batteries.—The HART ACCUMULATOR CO., LTD., have been appointed by Royal Warrant, purveyors of accumulators to His Majesty King George V.

Mazda Lamps on Battleships.—A very extensive series of tests have been conducted during the past year by the United States Navy on drawn-wire Mazda lamps, to determine their serviceability for use on warships. The formal test, which was started in November, 1910, was continued until July 1st, 1911, at which time such satisfactory results had been obtained that the test was considered concluded. Since that time, however, the officers on the ships have kept track of the lamps, and a recent letter from the ordnance officer of U.S.S. *Washington* states:—"Mazda lamps have made an excellent showing, and every day adds to their record. Many of the lamps (about 80) are still burning which were installed in November and December, 1910, and, to all appearances, are just as bright as ever." The following is a summary of the results given by Mazda lamps on board battleships for the period from November and December, 1910, up to July 1st, 1911:—

Size.	Total installed.	Average life.	Lamps broken during target practice.
25-watt	375	755 hours	12 lamps, or 4 %
40 "	842	1,155 "	28 " " 3 %
60 "	36	1,677 "	1 " " 0·3 %
400 "	8	1,386 "	—
500 "	9	2,563 "	—

These tests speak well for the durability of the drawn-wire Mazda lamps, and show that it is now possible to employ these high-efficiency lamps on board war vessels or any kind of boats; for since they successfully withstand target practice, they are suitable for any kind of service conditions on board ship.

Stoke-on-Trent Electricity Department.—Mr. C. H. Yeaman, chief electrical engineer, announces that the address of his department has now been altered, and all letters and communications intended for him, and in connection with electricity supply in the County Borough of Stoke-on-Trent, should be forwarded to "St. Peter's Chambers, Glebe Street, Stoke-on-Trent," where the central offices of the Electricity Supply Department of the borough are now situated. In these offices all business connected with the electricity works in Burslem, Hanley, Longton and Stoke will be transacted.

Vibration Prevention.—We are informed that the KORFUND CO. have just completed the insulation of a Diesel engine foundation at Friary Brewery, Guildford.

Stoker Contracts. — Among stoker orders recently executed by the UNDERFEED STOKER CO. are the following:—

Sheffield Corporation Electricity Works, 4A; Colombo Tramways, 1E; Corporation of Glasgow, Dalmuir and Partick Pumping Stations, 8E; Portsmouth 90-H.P. Pumping Station, 2E; Midland Railway Carriage and Wagon Works, 4E.

Trade Announcements.—THE ELECTRIC AND GENERAL STORES CO. are removing their head offices, warehouses and showrooms to Pudding Chare, Newcastle, whilst retaining the Sunderland premises for some months longer. The premises in Newcastle will open on January 1st.

MESSRS. W. F. JOHNSON & CO., electrical engineers, have opened larger premises at 7 and 9, Wellington Street, Douglas (Isle of Man).

MR. JAMES TAYLOR, who has been a partner in the firm of Gooding & Taylor, electrical engineers, of 43 and 44, Upper Russell Street, and 3, Blucher Place, Brighton, has commenced business as an electrical engineer at 75, North Street, and 92, Osborne Road, Brighton.

India.—India, says a German Consular report, affords an enlarging outlet for electrical goods, although it is only in the towns and in the newer portions that houses are fitted with electric light, fans, and heating apparatus. No figures are available of the imports of electric lamps, but German statistics show imports in the last three years of M.54,000, M.165,000, and M.110,000 respectively. Second only to lighting is ventilating, and the imports of electric fans of sundry kinds reach considerable figures. Opportunity for the export of a large quantity of electrical machinery and transmission material is supplied by the great hydro-electric station, whose construction the firm of Tata is financing. It will supply current to drive over 3,000,000 spindles and 40,000 weaving spools in Bombay. It is also stated that in the course of next year a large portion of the Bombay spinning and weaving mills will be worked by electricity.—*Zeitschrift fur Turbinenwesen.*

Book Notices.—"*Mechanical World* Electrical Pocket-Book for 1912." Manchester: Emmott & Co. Price 6d. net.

"*Proceedings* of the American Society of Civil Engineers." Vol. XXXVII, No. 9. November, 1911. New York: The Society.

"*Bulletin* of the Imperial Institute." Vol. IX, No. 3. 1911. London: Eyre & Spottiswoode, Ltd. Price 1s.

"Atti Della Associazione Elettrotecnica Italiana." October, 1911. Milan: Stucchi, Cenetti e C.

"*Bulletin* of the Association des Ingenieurs Electriciens." September, 1911. Liége: The Association. Price 4 fr.

"*Journal* of the Institution of Municipal Engineers." Vol. III, No. 3. November, 1911. London: The Institution Offices. Price 1s.

Consular Notes.—Sweden.—The British Consul at Gothenburg, in a recent report, states that the year 1910 recorded an important increase in the amount of water power made available. No less than 21 water-power installations were completed; 20 of these are private installations, varying from 300 H.P. to that of the Stora Kopparbergs Bergslags Aktiebolag at the Bullerforsen with 24,000 H.P., and the Sydsvenska Kraftaktiebolag's last two stations of 10,000 H.P. One installation is the property of the State, namely, that at Trollhätten, which, with its 40,000 H.P., is the largest of them all. In addition, there are five water-power installations of altogether 7,650 H.P. that were rebuilt during the year, whereby the increase of electric power which the country received during 1910 amounted to 111,280 H.P. There are building seven private water-power stations with a total of 65,000 H.P., and, furthermore, the installation by the State at Porjus was also begun during the year, and with its 50,000 H.P., raises the total horse-power at the stations now building to 115,000 H.P.

The British Vice-Consul at Halmstad reports that the great power plant on the Lagan River was completed during 1910, and was opened by the King. An extension, on which work is to be begun at once, has been decided on, and the money necessary for this purpose has been provided. The work already done is excellent, and provides proof of the high standard to which electrical engineering has been brought in Sweden.

The British Vice-Consul at Ystad reports that plans have been adopted for the construction of an electrical works in that town. These works are expected to be completed in the course of next year.

Formosa.—The British Council in Formosa reports that six electric cranes of the kind known as the electric tower transporter have been ordered from the United Kingdom. They are said to work very rapidly, and a feature of great importance at Keelung, where during the winter half-year the rain is almost continuous, is that the cargo can be worked under a movable covering which is attached to the crane. Electric capstans will be erected on the quays to move the cranes, which will run on rails. A wireless telegraph station was completed on October 11th, 1910, at Fukikaku, the northern extremity of the island. A submarine cable was completed from Tamsui to Nagasaki on November 1st, 1910, from which date the use of the old cable from Keelung to Kagoshima was discontinued, the cable being much out of repair. A contract has been obtained by a British firm for the Takow waterworks, and the plant will be of British manufacture. The pumps are driven electrically, and will receive their supply of power (three-phase) either from the Government electric power lines or from their own steam power station, which has a Babcock & Wilcox boiler. Practically the whole of the electrical supplies had hitherto come from German and American makers. The water is to be taken from the river and pumped up to a height of 250 ft. through a length of 10,000 ft. of mains.

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LIGHTING and POWER NOTES.

Abercarn.—The U.D.C. has decided to apply for a prov. order for extending the period for carrying out the order obtained in 1906, and to enable the Council to lease the order to the South Wales Electrical Power Distribution Co.

Accrington.—The borough surveyor and the electrical engineer have been requested to prepare plans and estimates for the installation of a special gas engine plant for generating electricity in order that the Committee may cope with the increased output involved by the supply of current to neighbouring townships. It is desired to obtain the services of Mr. Percy Allen, of the Castner-Kellner Alkali Co., as consulting engineer in connection with the proposed plant.

The Corporation recently quoted special terms for the supply of current for the working of a cotton mill in Victoria Street. This was tried as an experiment for six months, and it has proved so successful that the agreement has been renewed for a further period of 12 months. The Electricity Committee has also quoted terms for the supply of current to the Altham Colliery, some few miles away.

Afghanistan.—A scheme for giving Kabul an electricity supply is being prepared by Messrs. F. & C. Osler, who have arranged to put down a water-power plant near the River Salong, where a head of 130 ft. can be obtained, and to install three 500-KW. sets of three-phase 60-cycle turbo-generators, which as arranged will be able to deliver close upon 1,500 H.P. to the Government workshops in Kabul, and supply the public and private lighting, &c., in addition. The transmission distance is about 40 miles, and a pressure of 44,000 volts is proposed. The cost of the scheme, says the *Indian Textile Journal*, is estimated at Rs. 10,000,000, and the bulk of the plant is coming from America.

Argentina.—Tne River Plate Electricity Co.'s riverside station at the Port of Ensenada is now practically completed, and successful trial runs have taken place. The plant consists of two Westinghouse turbo sets of 2,000 KW. each with boilers, condensers, &c. This station, with its corresponding sub-stations, will probably not be put into continued service until March. Extensions have been commenced for the erection of a further 3,000-KW. turbo-generator. Steps are being taken to extend the company's business in other towns of the Province of Buenos Ayres.—*Review of the River Plate.*

Barrow.—The T.C. has decided to support the Bill being promoted by the I.M.E.A., and guarantee a share of the expenses involved, providing that the liability does not exceed £10.

Bath.—At the last meeting of the City Council considerable time was taken up in discussing a recommendation from the E.L. Committee that the Council should join in the promotion of the I.M.E.A. Bill, provided that its share of the costs incurred did not amount to more than £100. In moving that the recommendation should be deleted, a councillor said that the Bill contained some very favourable clauses, but, on the other hand, it contained some clauses he was not in agreement with. The clause he took exception to was that which he considered would conduce to trading by the municipality, which would make the position of private traders uncertain. It having been pointed out that the number of private traders would be very small, another speaker said that the interest of even a limited number of Bath tradesmen should be very carefully considered. Then came speeches in support; the first speaker said the electric lighting undertaking was a municipal affair, the property of the ratepayers, and if it was to be carried on successfully, they must adopt such measures as were adopted by private undertakings. They had already contributed to the prosperity of private business, by establishing the electricity undertaking, and at least they were not likely to damage it wantonly. The Council should recognise its obligations not only to individual traders, but to the whole of the ratepayers, who were proprietors of the undertaking. Other speakers referred to the progress at Bristol, and alluded to the time when arc lamps were introduced into the city. Shopkeepers could not afford to buy them, and the tradesmen refused to let them out on hire for a small rental; if it had been in the position, the Council could have improved its electric light undertaking enormously by the supply of such lamps. It was pointed out by another speaker that when they placed electricity at the doors of houses, and had to leave it there, because they could not supply the fittings, it was apparent they were losing a most remunerative part of the undertaking. The discussion was concluded by the chairman of the Committee, who said they were only asking the Council to contribute £100 in order to assist the promotion of the Bill, so that they might adopt some of the clauses which they might find necessary. The undertaking was the property of the whole ratepayers. They had over 10,000 ratepayers, and some 12 of these might be affected. But the Council must remember its duty to the 10,000 ratepayers. In the end the amendment was defeated by a large majority.

Bolton.—The borough electrical engineer has been requested to submit to the next meeting of the Electricity Committee his scheme for the proposed new station at Back-o'-th'-Bank.

Brighton.—The recent electrical exhibition promoted by the Corporation was in every way a success, judged by the numbers attending—some 40,000—during its three weeks' run. During the time 32 practical electric cooking demonstrations were held, two of them being on an exceptionally large scale, and we understand from Mr. John Christie that an evident interest has been aroused amongst those who will possibly adopt electrical cooking.

Burnham (Somerset).—At a special meeting of the Urban Council, the Electrical Committee brought up a report on the Council's electric lighting scheme. A motion was unanimously carried that the Council apply before December 21st to the B. of T. for a provisional order.

Bury.—The T.C. has appointed a committee to consider the advisability of opening an electricity showroom, on the lines of that worked by the gas department.

Cheltenham.—It was stated at the meeting of the T.C. that the Corporation electricity undertaking had made a gross profit of £13,485, which, after deducting financial charges, gave a net profit of £3,225.

Chester.—The Corporation has abandoned the site of the electricity works for the proposed refuse destructor. One of the strongest opponents of this site was the Chester General Infirmary Board of Management, because of the detrimental effect it was alleged it would have upon the well-being of the infirmary patients. The proposed site was in the immediate neighbourhood and to the windward of the infirmary, in connection with which a scheme of extension, amounting to £25,000, has been provisionally adopted.

Continental Notes.—GERMANY.—A beginning has been made with the construction of the ebb and flow or tide-driven power station at Husum, which is expected to be completed next year, and by 1913 the districts of Tondern, Flensburg, Sleswick, Eckernförde, Rendsburg, Norder and Süder Dittmarsch, Eidersted and Husum, in the province of Sleswick-Holstein, will be supplied with cheap electricity for all purposes. The scheme contemplates the building of a dam from Nordstrand to the mainland, whereby, by means of a transverse dam, two immense water basins will be created, the high-water one having an extent of 600 hectares and the low-water basin of 900 hectares. A simple but ingenious sluice arrangement will provide a fall between the sea and one of the basins, whereby the turbines will be driven. The ebb and flow of the tide will cause a rise and fall of the water in the basins, but between the level of the sea and that of the basins there will always be a difference. The turbines will drive constant-current dynamos. When completed the installation will serve as many as 700 communes in the province. The Nordstrand dam is already finished.—*Zeitschrift für Turbinenwesen.*

The projected power plant which is to be erected in the province of Hanover, is, according to information communicated to the District Council, to serve 12 districts, besides the cities of Kassel and Göttingen. The erection of three dams is projected, one near Hemfurt, on the Eder, one near Helbinghausen, on the Diemel, and one between Gimbe and Münden, on the Weser. An aggregate of 29,000,000 KW.-hours a-year will be furnished. This power will be distributed to the several districts in definite proportions, by a company to be formed representative of them. According to calculations, husbandry will require for light and power 5,000,000 KW.-hours, and industries 12,000,000 KW.-hours for power alone, and 6,000,000 KW.-hours for lighting. Over and above this, calls are expected later on behalf of the projected Upper Weser Valley Railway.—*Elektr. Zeitschrift.*

The large power station which it is proposed to build at Franken has advanced a stage towards realisation by the adhesion to the project of the city of Nürnberg and the commune of Fürth, and the assent of the commune of Nürnberg is alone awaited. The estimated cost of the scheme is 18,000,000 marks, and a company is being formed with 4,000,000 marks to carry on the work. It is proposed to raise additional capital by the issue of bonds.

FRANCE.—A beginning of the extensive hydraulic works in connection with the comprehensive scheme to utilise the River Durance for the production of electricity is about to be made. The Ministers of Public Works and of Agriculture have found common ground with regard to a credit of 150,000 fr. required for the preliminary surveys, and the work of taking soundings on the bed and below the bed of the river is about to be undertaken. It is intended to sink a shaft to the depth of 30 metres, and then drive a tunnel under the Durance. This will give valuable information regarding the nature of the subsoil, in view of the construction of the dam, which will rise to a height of 80 m. above the present water level. This undertaking is, in fact, a portion of the gigantic scheme drafted by M. Wilhelm, engineer in chief of the Ponts and Chaussées des Hautes-Alpes, to appropriate for industrial uses the whole of the watershed of the Upper Alpes.—*Revue Pratique de l'Electricité.*

SWITZERLAND.—An important hydro-electric scheme is projected in the Valley of the Emme River. The idea is to create at Rehbloch, near Schangau, a reservoir of 35,000,000 cb. metres capacity and capable of yielding at the start 4,000 H.P., raised eventually to 16,000 H.P. The cost of the dam and station are estimated at 8 million fr. The current will be supplied to the various industries along the course of the river. A subsidiary benefit derived from the scheme is the lessening of the loss from the freshets incidental to this river and the equalisation of its waterflow in the various seasons.—*Revue Pratique de l'Electricité.*

SPAIN.—A new company has just been formed in Barcelona with a capital of £400,000 and the title La Sociedad Energia Electrica de Catalunya. The Compagnie Générale d'Electricité, of Paris, is interested in the new undertaking.

Sweden.—As far back as 1905 the city authorities of Stockholm acquired the waterfalls of Tammsforsen and Kvarnforsen, but they have hitherto had no opportunity of utilising the water power owing to the State laying claim to the falls on the ground of sovereign rights. The differences between the contending parties were adjusted some time ago, and as the city has made provisional arrangements for the purchase of the land surrounding the falls, the latter have now become the undisputed property of the city. The managers of the municipal gas and electricity works have now suggested that the construction of the power station which was proposed on the acquisition of the falls should be taken in hand as soon as possible.

According to the plans, the quantity of water counted upon amounts to 250 m. per second, which would given 37,000 H.P. or 21,500 KW. transmitted to and delivered at Stockholm. The average flow of water has during years been about 300 m. per second, which figure, however, during the snow-melting has risen to 1,300, and even up to 2,100 m. per sec., while during the dry season it has been as low as 100, and in exceptional cases, 80 m. per second. The estimate is, however, based on 250 m. per second during eight months of the year, when about 19,000 KW. could be delivered in the town. The total cost of the project has been estimated at £775,000, of which £322,000 would be required for the works in connection with the harnessing of the river, while £228,000 would be required for the power station and nearly £100,000 for transmission purposes. The cost of the plant, exclusive of cables and transformer station at Stockholm will amount to £15 11s. per turbine H.P., which is a normal amount. The working expenses per year, including depreciation, have been estimated at about £55,000, the exact amount being dependent on the percentage of depreciation. On the basis of an average delivery of 19,000 H.P. at Stockholm, the cost of the energy will be from 55s. to 64s. per KW.-year. The difference in the amounts depends on whether the energy is utilised during 3,000 hours per year only, or during 8,760 hours. The corresponding cost of energy from a steam station at Stockholm amounts to about the same on the basis of the energy being utilised during 2,500-3,000 hours. If the time, however, is increased to 8,000 hours, the steam power becomes 100 per cent. dearer. The price of the energy from the Trollhatten works for Gothenberg has, as per contract, been stipulated at 72s. per KW.-year for a working time of 3,000 hours, and at 100s. for a working time of 8,000 hours. The energy for Stockholm will thus be considerably cheaper than that for Gothenberg.

Belgium.—Electricity is being adopted as a motive power at all the pits of the Société des Charbonnages de Strepy-Bracquegnies, in the Hainaut district. Transformer sub-stations are to be established at each of the pits, the current being supplied to the same from a central generating station, at a voltage of 3,200, by underground cables.

Russia.—The adoption of electricity as the motive power in the rolling mills of the Société Metallurgique Dnieprovienne du Midi de la Russie, at Kamenskoie, is making excellent progress. At the central power station three sets of 2,000-H.P. engines and dynamos are already at work, while two additional sets are in course of erection.

Austria.—Messrs. Ganz & Co., of Buda-Pesth, have just signed a contract for the erection of a hydro-electric station in Dalmatia, which will be one of the largest in Europe. It is to be built near Almissa, for the Società per le Utilizzazione delle Forze Hidrauliche delle Dalmazia, of Trieste. The water-power of the Cetina will be utilised, and of the 200,000 H.P. available, only 40,000 H.P., in two units of 20,000 H.P. each, will at present be used. The current will be transmitted at 55,000 volts. The Kreditanstalt, of Trieste, which has just agreed to advance the capital of 6,500,000 kronen, reserves the right for two years to convert its credit into shares and bonds.—*Zeitschrift für Turbinenwesen.*

Corsica.—A concession has lately been granted for the establishment of a plant to utilise the water-power of the River Restonica in the generation of electrical energy for lighting and power purposes at Corta.

Coventry.—The T.C. has decided to support the Bill of the I.M.E.A. seeking powers to enable local authorities to undertake wiring work and the supply of fittings, &c., and to contribute up to £10 towards the expenses.

Derby.—The accounts of the electricity undertaking of the Corporation for the past year show that there was a gross profit of £20,827, as compared with £18,328 in 1910. The net profit realised was £1,770, as against a net loss of £79.

Frome.—At a meeting of the R.D.C. the agreement for the transfer of the electricity works from the Council to Messrs. Edmundson, the contractors, was approved. It was stated that Messrs. Edmundson had agreed to relieve the Council of all income-tax payments, and these, between now and the year 1929, would amount to £2,154. The electricity supply was introduced on condition that the contractors ran it for 25 years, repaid by half-yearly instalments the principal and interest on the money borrowed, and at the end of the 25 years handed over the works to the Council free. Now the ownership of the works is to be transferred to the contractors, and they will continue to repay the loans to the Council

Great Harwood.—The District Council has confirmed its resolution to apply for a provisional order, despite the objection of two members. It has also decided to launch a scheme for the establishment of a generating station on land belonging to the Council in Wood Street, at an estimated cost of £8,085. In due course a L.G.B. inquiry will be held, when there is likely to be some discussion on the part of those who do not approve of the Council's proposals.

Greenock.—Several leading shipbuilding firms in Port Glasgow are co-operating in the movement to secure a supply of electricity from the Greenock Corporation. It has been proposed that a conference be held to discuss the whole question of terms, &c., and the town clerk of Port Glasgow has been approached with this end in view.

Horsham.—By a majority, the U.D.C. has decided to support the Bill of the I.M.E.A., and to contribute towards the cost. The objection on the part of some members was that the powers sought further legalised municipal trading.

India.—The *Indian Textile Journal* states that an Exhibition of Old Bombay is being held during the visit of the King and Queen. Messrs. F. & C. Osler have secured the electric supply work, which will include that to 2,000 50-C.P. lamps for buildings, 120 1,000-C.P. lamps, and over 10,000 smaller lamps for general illumination, aggregating 326 KW. In addition to the above, Messrs. Osler will distribute about 30 KW. for the electric fountain, 97 KW. for the power and lighting required for the scenic railway, and about 44 KW. for sundry other shows, making 246 KW. The current will be supplied from the high-tension mains of the Bombay Electric Supply and Tramways Co. to a sub-station from which Messrs. Osler will distribute over three-phase low-tension mains for the Exhibition lighting as above described.

Lincoln.—The T.C. has applied to the B. of T. for consent to utilise overhead wires for the transmission of current at a pressure of 500 volts to the works of Messrs. Jas. Dawson & Son, Ltd., which are in the area of the Branston R.D.C.

Leeds.—A summary presented to the Tramways and Electricity Committee gives particulars of the city's electric lighting undertaking for the summer half-year ended September 30th. The gross profits were stated at £24,536, as compared with £21,902 in the corresponding period of 1910. The total revenue for the half-year is greater by £2,699 than that of the same period of last year, whilst there is a reduction in the amount of interest payable, and after charging £17,500 towards the yearly contribution for the repayment of debt (£1,100 more than a year ago), the total expenditure shows an increase of £920. Setting the increase of £2 699 in the income against the increase of £920 in the expenditure, the financial result of the half-year's work is £1,779 better than that for the previous corresponding period, the deficit being £7,199 against £8,979. The first half of the municipal year, representing the summer months, must, of course, always show a deficit, whilst the income of the department depends so much, as at present, on lighting. Altogether 6,573,365 units have been sold, or close upon a million more than in the first half of 1910. During the last three or four years the sale of electricity for lighting has been diminishing, notwithstanding increasing use, the larger usage having been more than counterbalanced by the saving due to the introduction of metal-filament lamps. Sales, however, to private consumers for lighting, power and heating purposes have slightly increased, this being due, to some extent, to the larger number of motors in use, the aggregate capacity having grown from 14,034 H.P. to 16,409 H.P. in 12 months.

Leith.—The pumping station at the new dry dock will contain three electrically-driven centrifugal pumps, capable of emptying the dock in 2½ hours; the amount of water to be pumped is about 2,500 tons.

Liverpool.—The Electricity and Tramways Committee has had under consideration the question of renewing some of the Lister Drive generating plant. Tenders were considered for the supply of two new sets to replace two of the ten in use, and it was practically agreed to accept a tender of £100,000, and to sell the old sets for £4,000.

London.—Mr. H. R. Mott, acting electrical engineer to the City Corporation, states in his report for the past year that the incandescent electric lamps now used by the Corporation had been found better for efficiency and light than any of the 10 other different makes which had been tested on these points during the period under review. Visits had been paid to 19 fires in the City, and 4 out of 11 of these fires which had been electrically caused would not have occurred had iron tubing been substituted for the wood casing in which the wiring had been run. The cause of three serious fires were put down to electricity. The department had given technical advice with regard to the agreement between the Corporation and the City of London Electric Lighting Co. for the installation of mains to supply energy at the Coal Exchange. Mr. Mott, concluding, states that an appreciable saving in minor repairs had been effected through the system of monthly inspections.

The County of London Electric Supply Co. is at present giving demonstrations of vacuum cleaning and electrical cooking at its showroom in Upper Richmond Road, Putney. We understand that a vigorous publicity campaign is being conducted by the company in connection with the above, and that the efforts are meeting with a ready response.

Bermondsey.—Application is to be made to the L.C.C. for sanction to borrow £2,782, made up as follows:—Mains, £2,000; services, £250; meters, £500; plant, £32. Tenders are to be obtained for fitting 14 arc lamps in the borough, with lowering gear. With regard to the refusal of the L.C.C. to advance the loan of £18,563 for the Council's undertaking, the Electric and Street Lighting Committee reports that its appeal to the L.G.B. thereon is proceeding.

Norwich.—Owing to the success of electrical street lighting, the T.C. has decided to proceed with the conversion of a second area of the city. The work is to be completed by October 1st, 1912, and will leave only one-third of the city not electrically lighted.

Perth.—Keen interest has been aroused by the intimation of the intention of a company to apply for a provisional order enabling it to acquire the sole rights of Loch Ericht and other waters in the district for power purposes. A similar order, promoted some years ago in connection with the raising of the loch and the carrying through of a scheme for the generation of electricity, never went to proof, on account of the strength of the opposition. The present order, however, contains proposals regarding compensation, water, &c., which may meet the objections to the previous scheme. A special committee of Perth T.C. will be appointed to look after the interests of the city in the matter.

Peterborough.—At its meeting last week, the T.C. discussed means of extending the electricity works in view of the largely increased demand, especially for power purposes. The question of purchasing property near the existing works will come up again for discussion. It was agreed that where electricity is supplied on the ordinary scale for power purposes, a discount of one farthing per unit be made where the supply exceeds 5,000 units per quarter.

Rawtenstall.—The T.C. has decided to give moral, and not financial, support to the Bill of the I.M.E.A. seeking powers for municipal authorities to wire consumers' premises, and to supply fittings, &c.

Reedley Hallows.—The Burnley T.C. has applied to the B. of T. for an order to enable it to extend the mains to this parish, which is in the area of the Burnley R.D.C.

Sherborne.—A prov. order for E.L. is being applied for by Messrs. Purves, of Exeter.

Siam.—Owing to the abandonment of the Petchaburi Palace under construction for the late King, efforts are being made to dispose of the electrical installation for the latter, and it has been proposed to transfer it to Chiengmai, the second city in the kingdom, which is still without any scheme of lighting. The difficulty is that no suitable fuel exists, and only a water power plant appears feasible.

South Africa.—According to *African Engineering*, the Shamva Mine, near Salisbury, Rhodesia, is contemplating the installation of a 4,000-KW. power station.

Southborough.—The U.D.C. has deferred for a year the question of obtaining a prov. order for E.L.

Stalybridge.—The Stalybridge Joint Tramways and Electricity Board has resolved that under the direction of the chairman and engineer, an order for a second 3,000-KW. turbine is to be placed. At the meeting, Councillor Bottomley stated that it was essential that a duplicate turbine set be ordered as quickly as possible, because the demands for motive power were coming in so rapidly that he was afraid that even with this turbine, they would not be able to meet all requirements.

Swansea.—A writ has been issued by the gas company against the R.D.C. for an injunction restraining the Council from supplying electricity for lighting purposes within the Clase and Llansamlet districts. The gas company contends that the Council is debarred by an agreement which exists between them. At present a great part of Llansamlet is lit with electricity, and the Swansea Gas Co. has recently been extending its system considerably in the same area. It is understood that the point at issue is whether the gas company has exercised reasonable expedition in meeting the needs of the district.

Tunbridge Wells.—The Lighting Committee of the T.C. has decided to apply to the L.G.B. for a loan of £6,000 for extensions, &c., for the next three years.

Wednesbury.—The T.C. has received the sanction of the L.G.B. to the borrowing of £3,723 for electricity purposes. This amount is to be expended as follows:—£610 on additions to cells; £715, booster, regulating switches and pumps; £945, feeder main to King's Hall; £558, extensions of central station; £1,395, mains (excess expenditure) and future extensions; and £700, services. The cost of new switches to the amount of £74 is to be defrayed out of current account.

West Bromwich.—The Electricity Committee, in order to meet the increasing demands and to ensure certainty of supply to consumers, finds it necessary to install further generating plant; and for that purpose it is asking the Council for permission to spend a sum of about £10,000 to keep the works up to date so as to meet all emergencies.

West Hartlepool.—It is stated that the L.G.B. has sanctioned the borrowing of £38,651 by the T.C. in connection with the proposed "waste heat" plant which it is proposed to install in agreement with the Seaton Carew Ironworks. It will be remembered that this proposal was strenuously opposed by the local power company.

Worcester.—The Electricity Committee has resolved that application be made to the L.G.B. for sanction to borrow £7,250, which is made up as follows:—Mains in conduits, £3,000; mains direct in ground, £1,000; services, £1,000; meters, £750; transformers, £1,350; transformer chamber and equipment, £250.

Worksop.—The U.D.C. had before it at the last meeting a recommendation of the Lighting Committee to obtain a loan for battery and condensing plant, also that Messrs. E. Bennis & Co., should supply a set of mechanical stokers with self-cleaning bars at a cost of £127 10s. The clerk stated that the cost of storage battery and condensing plant was £2,850. It was proposed to borrow £1,950, and to pay the balance out of current expenditure. The recommendations were adopted, as well as another approving of the Electric Lighting Bill, 1911, promoted by the I.M.E.A.

Worthing.—The T.C. has decided not to entertain a proposal from outside persons to acquire the E.L. undertaking.

Wrexham.—The T.C. has resolved that application be made to the L.G.B. for sanction to borrow £1,200 for electricity mains and £600 for house services.

TRAMWAY and RAILWAY NOTES.

Accrington.—The Tramway Committee is making an experiment by installing a Collins automatic point controller on the system as a safeguard against accidents and for traffic convenience. It will be supplied for £50 by Messrs. Quilliam Bros. The Committee also recommends the adoption of the Bell Punch system of issuing tram tickets and the universal system, which will dispense with the great variety of tickets now issued.

Birmingham.—The City Council has approved of the draft Bill in connection with the proposed Greater Birmingham tramways extension scheme.

Belfast.—The award of the arbitrator in the case of the purchase of the Cavehill and Whitewell Tramway by the Corporation having been put aside, it was announced at the fortnightly meeting of the Tramways and Electrical Committee that the arbitration would be heard again on the 15th inst.

Brighton.—The T.C. has been recommended to approve of the Bill seeking powers to construct rail-less trolley cars and run motor-'buses in Brighton, Hove, Portslade, Southwick and Shoreham. The scheme is estimated to cost £107,400 and a motor-'bus scheme £30,000, £3,000 being included as the cost of obtaining the Act. The Council is advised that, presuming proper fares are charged, the undertaking will be a financial success, and will cast no burden on the rates.

The Hove T.C. sitting in Committee on Monday decided, by 19 votes to 16, to oppose the Brighton Bill and to promote its own Bill. This decision has to be confirmed in open Council.

Continental Notes.—TURKEY.—It is stated that the A.E.G. is becoming interested in the second German electric railway scheme for Constantinople, to which reference was recently made, and that Mr. Rathenau is journeying to the Turkish capital in order to examine the question. The project relates to a line from Stamboul, *via* Pera, to the Black Sea.

ITALY.—The Superior Council of Public Works has sanctioned the conversion to electric traction of the funicular line from Como to Branate, at present worked by steam.—*Giornale dei Lavori Pubblichi.*

SWEDEN.—According to the *Daily Telegraph*, the tram fare in Stockholm is 10 öre, but one can buy a perforated card of 11 tickets for 1 krona, that is to say, the ordinary price of 10 fares. Some time ago a kind of perforated card was introduced, of which the 11th ticket is not available as a tram ticket, but its value goes to schools for teaching poor girls household matters, including the care of children. A great silk firm in Stockholm has found the idea so admirable that anybody who has five such cards, and can show the unavailable 11th tickets, can get 5 per cent. rebate on any goods bought at its warehouse. The cards have now a great sale, to the consequent benefit of the school.

Crewe.—A sub-committee has been appointed by the T.C. to consider the question of adopting the railless trolley system of traction.

Glasgow.—The first half of the financial year of the tramways undertaking ended on November 30th, and it was officially reported that the car receipts for the six months amounted to £501,532, as against £466,612 for the same period last year—a substantial increase of £34,920. This is the first occasion on which a half-year's revenue has exceeded half a million, a result which was in a considerable measure due to the Scottish National Exhibition in the city, and also the phenomenally fine summer, which brought more than the average patronage to the cars.

Subject to the final approval of the T.C., a system will be inaugurated on Sunday, first as a three months' experiment, over the municipal tramway system, by which users of cars will be enabled to travel double the present stages for ½d. In a lengthy report on the subject, Mr. Dalrymple, the general manager, referred to previous occasions upon which the Corporation expressed the opinion that it would be inadvisable to double the length of the ½d. stages. He quoted departmental statistics which went to show that to double the ½d. stage would mean a falling off in revenue of £130,254, out of a total income of £813,768. Replying

to the argument that increased traffic would make up for any reduction in the revenue, he quoted a previous report in which he contended that the increase in passengers could only be ½d. passengers, and that to make up the revenue would require an increase of over 62,000,000 passengers. The cars were now up to their full carrying capacity, so that the department would require to run additional cars, which, of course, would mean additional expenditure —indeed, to carry the increased number of passengers required to make up the revenue to the present amount would take at least 150 cars. The experience gained in connection with the operation of the present two-stage fare was referred to. This experience, however, was not of much value in estimating what would be the financial result of the change now proposed. Their experience with the two-stage fare had, however, shown this, that, as 18 million people per annum were at present using the two-stage ticket, which costs 1½d., all these passengers would, after the halfpenny stage was extended, be carried the same distance for a penny. This meant, of course, an immediate drop in revenue of about £40,000 per annum. The estimate given in the report of November, 1910, when the two-stage fare was instituted, was that 200,000 passengers per day travelled only two stages, for which they paid a penny. The number of passengers at present using the special two-stage ticket was, however, only 100,000 per day, or exactly one-half of the estimated number of those who might do so. Nothing had been said regarding the difficulty that the conductor would meet with in carrying out his work under the new conditions of an extended halfpenny fare; at the present time it was a comparatively simple matter for the conductor to check his halfpenny passengers. Should the experiment be tried, the Corporation should seriously consider whether it would not be wise to delay starting the trial until, say June 1st next, when the department could have 50 additional cars ready to cope with the increased traffic.

Leeds.—A special Investigation Committee of the T.C. has just issued a report on the question of complaints against officials, with special reference to matters affecting the tramways manager. The matter apparently originated with the local Labour party, and as regards Mr. J. B. Hamilton, concerned outside work carried out by him, among other matters. Full explanations were offered by Mr. Hamilton, who pointed out that he was under no definite legal agreement with the Corporation, and that the Committee's sanction had been obtained to various matters mentioned. The Committee endorsed the vote of confidence in Mr. Hamilton passed by the Council. Two of the Committee's decisions, however, appear to qualify the vote of confidence, one being that a direct journey to or from the house of an official, from or to his office, in one of the department's motor-cars be prohibited as private use of the same; the other deprecates the writing of private letters to officials on Corporation business, and suggests that such letters should in future be shown to the Committee concerned and become part of the official correspondence.

London.—Next week the District Railway will introduce a further development in connection with its traffic working. As a result of the opening for traffic of the extra tracks between Hammersmith and Chiswick Park, accelerations will take place all round, and during the busy hours every train will be "non-stop" for a portion of the journey. In view of the wonderful results achieved under electrical operation on this line, it is worth noting that from next week, the following increases in daily train services will be made:—Ealing, with 119 trains each way, will have 198; Turnham Green, 200, will have 270; Hounslow, 121, will have 135; South Harrow, 68, will have 92; and Richmond, 68, will have 70. Stations nearer town benefit proportionately, except, perhaps, where the non-stop working involves only alternate trains stopping at stations. Only some 3½ hours out of the 24 is unprovided with a service. The conduct of this company's service is an object lesson to the various railways which still cling to old-fashioned methods of working; although traffic opportunities may be less than on the District Co.'s route, they are undoubtedly even now beyond the capacity of steam traction methods.

In the annual report of the London General Omnibus Co. the directors, in referring to the negotiations which have been for some time proceeding between the company and the London Electric and Metropolitan District Railways, state that there is at present no definite scheme to suggest, but that if any arrangement should be arrived at the proprietors will be immediately consulted.

The *Pall Mall Gazette*, in commenting upon this statement, says: "Correct, as far as it goes. We can say in addition that, so far as the L.G.O. is concerned, the scheme is agreed. The real difficulty is that the District and the London Electric cannot quite agree as to the apportionment, between themselves, of the burdens and the benefits of the scheme. This alone is causing the delay. But the scheme cannot well be allowed to fail, especially if more 'bus competition is threatened."

Manchester.—The Tramways Committee has had before it the question of issuing contract tickets for use on the city tramways. Mr. McElroy, the general manager, in his report, reminded the Committee of his inquiries and report of four years ago, and stated that he had nothing to add, except that he had had the information corrected to date, and it would be observed that since 1907 the Wigan Corporation had discontinued the use of contract tickets, and the Cheltenham and District Light Railway Co. used them on one route only, but they regretted ever having made the concession. The Committee resolved that, in view of the report now presented, it was not desirable to issue contract tickets in connection with the Manchester tramway system.

Todmorden.—A Sub-Committee of the Corporation has been appointed to visit Leeds and Bradford, to view and obtain information as to the system of railless electric cars running there.

Westhoughton. — The U.D.C. has approached the Bolton Tramways Committee with a view to seeing whether the Bolton Corporation will undertake an extension of its system to Westhoughton. The peculiarity of the situation is that although Westhoughton is almost encircled by tramway routes, there are no such facilities in the town.

York.—The City Council has unanimously resolved that application be made to the Light Railway Commissioners for an order under the Light Railways Act, 1896, authorising the Council to make an extension of the tramways commencing in Queen Street and terminating in Victoria Street, a distance of a little over 9 furlongs.

TELEGRAPH and TELEPHONE NOTES.

Cable Rate Reduction.—An important announcement was made by the P.M.G., Mr. H. Samuel, in the House of Commons on Tuesday last, who said that he had been in correspondence with the Western Union Telegraph Co. in connection with the leasing of the Atlantic cables of the Anglo-American and Direct United States Companies, and that the three companies had agreed to accept Press messages not of an urgent character, which might be delayed for not more than 19 hours (clock time at both ends), at one-half the present rates. The Pacific Cable Board and the Australian Government had agreed to a similar reduction. The rates for deferred Press messages from this country to Canada, therefore, would be 2½d. per word instead of 5d., and to Australia and New Zealand 4½d. instead of 9d. He was in communication with the Commercial Cable Co. also on the subject. The service would come into full operation on December 15th. The Eastern Telegraph Co. had consented to carry the messages for Australasia at the reduced rates in the event of interruption to the Pacific Cable.

The Western Union Co. also proposed, on its own initiative, to establish a system of "night letters" and "week-end letters" from this country to places in Canada and the United States, consisting of plain-language telegrams at reduced rates. The former would be delivered on the morning of the second day after they were handed in, the charge being about one-quarter the usual rate, with a minimum of 6s. for 20 words or less; the latter would be accepted on Saturday for delivery on Tuesday, at one-fifth the present rate, with a minimum of 6s. for 30 words. From the 15th inst., the Post Office would accept these letter telegrams for places on the Western Union Co.'s system in America.

The rates for plain-language non-urgent telegrams between the United Kingdom and India, the Dominions, the Crown Colonies, and the United States, he added, would be reduced by one-half from January 1st next. No appreciable cost would fall upon the Treasury through these changes.

Mr. Samuel concluded by stating that he proposed to introduce experimentally the system of cheap night telegrams between London and Aberdeen and Belfast, at a charge of 6d. for 36 words and ½d. for every three words thereafter. The telegrams would be accepted up to midnight at the head offices, and delivered with the first morning delivery of letters.

Telephone Operators.—Medical experts who have been investigating the effect of telephone work on the operators have issued a report stating that no evidence was found of injury of any of the special senses. Anæmia and nervous debility are responsible for prolonged absences, and are the most prevalent complaints amongst young women in any sedentary occupation. Hysterical attacks are not numerous, and no complaint was made of impaired hearing.

U.S.A.—The *Telegraph and Telephone Age* states that the stockholders of the United Wireless Telegraph Co. have organised a protective committee, and will try to formulate a reorganisation plan by which the company may be taken out of the hands of the Federal Receiver. The stockholders in favour of the movement are requested to send in their proxies to the Committee, at 1, Wall Street, New York.

Wireless Telegraphy.—Communication will shortly be established between Banana, Boma and Elizabethville by wireless stations erected along the Congo River, and along the "Kasai-Sankuru."

The use of wireless telegraphy in Russia is being largely extended, and it has been decided to erect eleven stations in the Far East.

Electricity Supply at Bridgetown, Barbados.—In connection with our article on the above on page 909, last issue, we are informed by Messrs. W. T. Henley's Telegraph Works Co. that they carried out the whole of the work in connection with the overhead lines, cables, &c., some of the examples of which were illustrated on page 908.

CONTRACTS OPEN and CLOSED.

OPEN.

Australia.—New South Wales.—January 3rd, 1912. Sixty-nine switchboards, magneto, non-multiple, for the P.M.G.'s Department. See "Official Notices" November 24th.

South Australia.—January 3rd. One wire-testing machine, for the P.M.G.'s Department. See "Official Notices" Nov. 24th.

N.S.W. Government Railways.—January 8th, 1912.—Four 1,000-kw. rotary converter units. January 22nd, 1912.—Supply and erection at the White Bay power house, Sydney, of eight water-tube boilers, with superheaters, economisers and mechanical stokers. January 29th, 1912.—A 25-kw. booster set. Particulars, Electrical Engineer's Office, 61, Hunter Street, Sydney.

Bosnia.—Bjelina.—December 20th. The T.C. invites offers for the complete installation of a public and private lighting service, including station and staff dwellings. For further particulars see this column last week.

Brighton.—December 11th. One 750-h.p. three-phase induction motor, for the Corporation. See "Official Notices" December 1st.

Croydon.—December 22nd. The B.C. invites tenders for 2,000-volt and 5,000-volt switchboards, and erection of same complete (estimate £4,000). See "Official Notices" December 1st.

France.—January 5th, 1912. The French Post and Telegraph authorities in Paris are inviting tenders for a multiple telephone board for the Central Telephone Exchange.

Germany.—December 30th. The Konsortium Leitzachwerke, of Munich, is inviting tenders for the supply of six turbines and generators of 2,750 h.p., and two exciters of 300 h.p.

Glasgow.—Messrs. William Barr & Sons, coalmasters, invite tenders for the supply of requirements at all their collieries for the year. (10, Bothwell Street, Glasgow.)

Hornsey.—January 11th. One steam dynamo set (either reciprocating or turbine), for the T.C. See "Official Notices" to-day.

Leeds.—December 11th. Underground transformer chamber at North and South Street. Specifications, &c., from Mr. H. Dickinson, manager.

Middleton.—December 12th. Feeder and distributor cable, for the Corporation. See "Official Notices" December 1st.

New Zealand.—February 7th, 1912. Napier Corporation. (1) Permanent way, overhead work and supply mains; (2) power station, car-shed and repair-shop equipments; (3) rolling stock. Deposit 2½ per cent. Specifications can be seen at the Board of Trade Commercial Intelligence Branch in London.

Sheffield.—December 21st. Two sets of 25-kw. high-speed direct-coupled vertical engines and alternators, for the City Council. See "Official Notices" to-day.

Siam.—December 30th. Tenders are invited for five electrically-driven centrifugal pumps for the waterworks at Bangkok. Particulars, Local Sanitary Department, Bangkok.

Bangkok.—March 15th, 1912. Tenders are invited for the supply and erection of an electric power station with a capacity of 3,000 kw. Tenders, on the prescribed forms, to the Ministry of Local Government, Bangkok. For further particulars see this column for November 24th.

South Africa.—Johannesburg.—December 29th. Spare parts for tramcars and materials for overhead equipment, for the Municipal Council.

The *British and South African Export Gazette* states that large orders for machinery and plant for the Wynberg Municipality are in prospect as the result of the proposal to light the town by electricity. Four "A.E.G." 9,600-kw. turbo sets will be required as a first instalment for the fourth station of the Victoria Falls and Transvaal Power Co., Ltd., now in course of establishment at Vereeniging.

African Engineering states that the Municipal Councils of Claremont, Rondebosch and Mowbray, C.C., are inviting tenders for public and private electric lighting supplies.

South Shields.—December 13th. X-rays installation, West Harton Hospital, for the South Shields B. of G. Mr. J. W. Coulson, Clerk, Barrington Street.

Spain.—Madrid.—The Council of State have authorised acquisition shortly, by way of tenders, of telegraphic posts and insulators (to the value of 800,000 pesetas). Particulars, Direccion General de Corrios.

Las Palmas.—December 15th. The T.C. invites tenders for a water supply concession for 60 years and the use of waterfalls for electric power production. Particulars, Secretario de Ayuntamiento Las Palmas.

Uruguay.—February 6th, 1912. Tenders are invited by the Port Authorities at Monte Video for the supply of 13 electric cranes, together with 600 metres of steel rails. For further particulars, see this column for October 27th.

CLOSED.

Accrington.—The Electricity Committee has accepted the tender of Messrs. Quilliam Bros. for the supply for the tramway system of a Collins patent point-controller, at a cost of £50.

Australia.—An Australian exchange states that the Postmaster-General has accepted the tender of the Western Electric Co. for a new common-battery switchboard at Ballarat (V.), at £4,265.

The Sydney Municipal Council (according to the same exchange) has accepted the following tenders:—

Electricity meters.—Australian General Electric, £1,963.
Arc lamps.—Union Electric Co., £904.
Carbon arc lamps.—Siemens Bros., £1,604.
Fuse-boxes.—W. G. Watson, schedule prices.

The Victoria State Railways Department has ordered a complete set of Stone's electrical equipment, at £275, from Messrs. Noyes Brothers.

The Melbourne City Council has ordered 8,000 yards of fibre conduit (£275) from the Western Electric Co., and an overhead crane, at £180, from the Austral Otis Engineering Co.

Burnley.—The British Insulated and Helsby Cables, Ltd., have received the contract for the supply of various cables required through the widening of Colne Road.

Dunfermline.—The electrical installation in the new Women's Institute for the Carnegie Trust has been entrusted to Messrs. Melville, Robb & Scott, of Dunfermline, at £427.

Eccles.—The T.C. has accepted an offer of the British Westinghouse Electric and Manufacturing Co., Ltd., to supply consumers' electricity meters for the ensuing 12 months.

Glasgow.—The Clyde Navigation Trustees have accepted the following tenders in connection with the electric railway to be laid down for the conveyance of grain from the quay at Meadowside, Partick, to the new granary being erected erected there:—

350 tons 80-lb. steel rails and 1,050 fish-plates.—Glengarnock Iron and Steel Co., Ltd., £2,065.
77½ tons cast-iron chairs for the 80-lb. rails.—Anderston Foundry Co., Ltd., £308.
72 tons 40-lb. bulb rails and 420 pairs fish-plates.—Steel Company of Scotland, Ltd., £576.
95 chairs for the bulb rails.—Anderston Foundry Co., Ltd., £417.
Switches and crossings.—Mr. George Urie, £350.
4,800 sleepers.—James Kennedy & Co., £980.

The Trustees have also approved of the offer by Messrs. Fullerton, Hodgart & Barclay, makers of the pumping engines at the Prince's Dock power station, for the authorised additional engine, outlying accumulator, and accumulator tower at the Dock, at a total price of £3,613.

Lancaster.—The tender of Mr. E. Dewhurst, of Preston, for electric lighting and provision of electric bells at Dallas Road School, at £290, has been accepted by the Corporation.

Liverpool.—Special meetings of the Electricity and Tramways Committee were held on December 1st and 2nd to consider tenders for plant at the Lister Drive power station. The Committee was faced with the alternatives either of erecting a new power station, the construction and equipment of which takes a considerable time, or of adopting improved plant of larger size and greater output, and the latter procedure was adopted as being the more efficient and less costly in meeting the immediate requirements. The proposal, therefore, before the Committee was for an improvement at the Lister Drive No. 1 station by the gradual replacement of existing sets by new generating and condensing plant, and the tenders recommended by Mr. A. B. Holmes for acceptance are as follows:—

British Westinghouse Electric and Manufacturing Co., Ltd.—Two 2,000-kw. direct-current turbo-generators.
British Thomson-Houston Co., Ltd.—Two 3,500-kw. turbo-alternators, complete with circulating water-pipes and accessories (with the option of ordering two similar machines after test and acceptance of the above-named plant), and for the purchase and removal of the existing plant.
Worthington Pump Co., Ltd.—Four cooling towers and pipes.

The price mentioned for the sale of the "scrapped" engines was £4,000, and during the discussion surprise was expressed by some members of the Committee that two engines which 10 or 12 years ago cost £70,000 should now have to be sold for about £4,000. It was explained that there was a depreciation in plant of this character of 10 per cent. per annum. Councillor A. Gates moved that the report of Mr. Holmes be not accepted, and that outside expert advice be sought, but the proposal was defeated. In the end, the Committee decided to recommend the acceptance of the tenders to the Council. The total cost of the new installations will amount to some £100,000, of which £40,000 is now agreed to by the Committee.

The Tramways and Electricity Committee has accepted the following tenders :—

Messrs. Archibald Bathgate & Sons.—10,000 tons of Pemberton 5 ft. slack coal to the Pumpfields electric power station.
Messrs. Walter Scott, Ltd.—1,000 tons of "Sandberg silicon" rails to Liverpool section.
Lorain Steel Co., Ltd.—400 tons straight section tramway rails to British standard section, and 100 tons curved section ditto.

London.—L.C.C.—The Stores and Contracts Committee has accepted the tenders of Messrs. Plutte, Scheele & Co., Ltd., and Messrs. Ship Carbons, Ltd., for electric carbons for the year 1912.

The Highways Committee has recommended acceptance of the following tenders for sand crushing and drying plant for the Battersea Bridge and Poplar permanent-way depôts :—

—	(1) Sand-drying plant for both depôts.	(2) Crushing rolls, screens and elevators for both depôts.	(3) Stone-crushing machine, screen and elevator, for Leven Rd. depôt.	Total.
	£	£	£	£
Horsfall Destructor Co., Ltd. ..	—	651	—	651
T. & J. Hosking, Ltd.	1,015	—	—	1,015
St. James' Engineering Co., Ltd. ..	1,920	—	—	1,920
Hadfield's Steel Foundry Co., Ltd.	—	1,555	374	1,928
Joseph Booth & Bros., Ltd... ..	—	3,002	324	3,326
Goodwin, Barsby & Co.	1,715	1,226	441	3,382
James Buchanan & Son	1,950	1,350	500	3,800
The Butterley Co., Ltd.	1,940	1,597	465	4,002
Edgar Allen & Co., Ltd.	3,003	1,863	282	5,128

The lowest in each case is recommended: that of T. & J. Hosking, Ltd., £1,015, for sand-drying plant; that of the Horsfall Destructor Co., Ltd., £651, for crushing-rolls, screens and elevators; and that of Edgar Allen & Co., Ltd., £262, for the stone-crushing machine, screen and elevator.

The tenders for the equipment of both of these depôts with grinding machines, motors and switchgear, &c., were as follows :—

THREE PORTABLE ELECTRIC GRINDING MACHINES.—Price per machine.

Bambridge Patent Flexible Shaft Co., Ltd. ..	(recommended)	£73
C. W. Burton Griffiths & Co.		82 (less 2½)
George Robson & Co.		85 („ 5)
Selson Engineering Co., Ltd.		86 („ 2½)
Railway and General Engineering Co., Ltd.		95
United States Metallic Packing Co., Ltd.		110 („ 2½)
Hadfield's Steel Foundry Co., Ltd.		115
Consolidated Accessories Co.		128 („ 2½)

ELECTRIC MOTORS.—Price for five complete motors.

Electric Construction Co., Ltd.	(recommended)	£378
British Westinghouse Electric and Manfg. Co., Ltd.		457
General Electric Co., Ltd.		551
Lancashire Dynamo and Motor Co., Ltd.		571
Dick, Kerr & Co., Ltd.		626
British Thomson-Houston Co., Ltd.	(Not to specification)	

SWITCHGEAR.—Price for complete gear for both depôts.

Evered & Co., Ltd.	(recommended)	£86 (less 2½
Spagnoletti, Ltd.		94
Johnson & Phillips, Ltd.		95
Edison & Swan United Electric Light Co., Ltd.		98 („ 2½)
Electric Construction Co., Ltd.		109
General Electric Co., Ltd.		114 („ 2½)
British Westinghouse Electric and Manfg. Co., Ltd... ..		150 („ 2½)

The lowest tender submitted in each case is recommended.

The tenders received for machine-shop tools required for the same depôts were as under. Only one firm—Tangyes, Ltd.—tendered for all the tools required :—

Judson Jackson Co.	£1,782
Buck & Hickman, Ltd.	2,340
Pollock & MacNab, Ltd.	2,494
Tangyes, Ltd.	3,230
J. Holroyd & Co., Ltd.	1,421
C. H. Caton & Co., Ltd.	1,490
Greenwood & Batley, Ltd.	805
W. B. Haigh & Co., Ltd.	55

The lowest tender which complies with the terms of the specification for each machine is accepted in each case. The total amount of such tenders is £2,054. The tenders accepted are these :

Judson, Jackson & Co.—Four drilling machines, two grinding machines, and two power hack saws, £692.
Buck & Hickman, Ltd.—Two shaping machines, one rail-cutting saw, and one planing machine, £793.
Pollock & MacNab, Ltd.—Three screwing machines, £390.
W. B. Haigh & Co., Ltd.—Timber-cutting saw, £55.
C. H. Caton & Co., Ltd.—High-speed lathe, £185.

A contract has been given to Messrs. G. Hayward & Co., Ltd., for 22 movable platforms for car-cleaning at Streatham car-shed extension.

FULHAM.—The Electricity Committee has recommended the acceptance of the tender of the British Electric Transformer Co., Ltd., for 20 new transformers for sub-stations (14 50-KW. and six 100-KW.), subject to an allowance made by them for 15 old transformers, at £905 net. The tenders received were as follows :—

	20 50-KW. transformers.	Alternative for 14 50-KW. and 6 100-KW.	Allowance for 15 old transformers.
British Westinghouse Co.	£1,100	£1,126	£165
A. H. Greening	Not according to specification.		
Ferranti, Ltd.	£1,150	£1,171	£131
Johnson & Phillips, Ltd.	840	873	222
Carney & Pearn, Ltd...	840	868	75
British Electrical Engineering Co.	1,275	1,280	190
British Electric Transformer Co., Ltd.	710	750	Already deducted from prices quoted.

Rochdale.—The Baths Committee has let the contract for wiring Smith Street baths for electric lighting to the Rochdale Electric Co.

Salford.—The T.C. has accepted the tender of Messrs. Browett, Lindley & Co., Ltd., at £392, for the supply of a 60-H.P. compound vertical steam engine with Lancashire dynamo and switchboards required in connection with their slab-making scheme at the Agecroft Depôt.

Torquay.—The tender of Messrs. T. L. Harding & Sons, of Torquay, has been accepted for the electric light installation at the new post office.

Warrington.—The tender of Messrs. British Insulated and Helsby Cables, Ltd., has been accepted by the T.C. for the supply of medium-tension cable.

Worcester.—The Electricity Committee has accepted the tender of Messrs. Jens Orten-Boving & Co., London, for a vertical turbine and Westinghouse alternator, at £1,828.

Worthing.—The T.C. has accepted an offer by the Anglo-American Oil Co., Ltd., to supply the oil required in connection with the new Diesel oil engines, at 48s. per ton.

FORTHCOMING EVENTS.

Northampton Institute Engineering Society.—Friday, December 8th. At 7.30 p.m. Annual prize distribution, by Sir Wm. H. White.

Royal Astronomical Society.—Friday, December 8th. At 5 p.m. At Burlington House. Paper on "The New 'Synchronome' Astronomical Regulator," by Mr. F. Hope-Jones.

Institution of Post Office Electrical Engineers (Metropolitan Centre).—Monday, December 11th. At 6 p.m. At the I.E.E. Paper on "Distribution by Means of Parallel Cables," by Mr. E. A. Pink.

Institution of Electrical Engineers (Manchester Local Section).—Tuesday, December 12th. At 7.30 p.m. At the University, Manchester. Paper on "Heat Conductivity in Electrical Machinery," by Messrs. M. Walker and H. D. Symons.

Institution of Electrical Engineers (Scottish Local Section).—Tuesday, December 12th. At 6.30 for 7 p.m. At the Grosvenor, Glasgow. Annual dinner.

Royal Society of Arts.—Wednesday, December 13th. At 8 p.m. Paper on "Continuous Service in Passenger Transportation," by Mr. W. Yorath Lewis.

Institution of Electrical Engineers (Birmingham Local Section).—Wednesday, December 13th. At 7.30 p.m. At the Technical School, Birmingham. Papers on "Automatic Starting of Asynchronous Motors," by Mr. N. Pensabene-Perez, and "Some Notes on the Circle Diagram," by Mr. T. F. Wall.

Junior Institution of Engineers.—Wednesday, December 13th. At 8 p.m. At the Institution of Electrical Engineers. Lecture on "Steel Specifications Considered Commercially," by Maj. H. B. Strange.

Association of Engineers-in-Charge.—Wednesday, December 13th. At 8 p.m. At St. Bride's Institute, E.C. Paper on "Methods of Dealing with Losses in Steam Plant due to Condensation," by Messrs. G. and J. R. Wilkinson.

Institution of Electrical Engineers (Dublin Local Section).—Thursday, December 14th. At 8 p.m. At the new Royal College of Science, Dublin. Paper on "Small Electricity Supply Undertakings," by Mr. P. L. Spalding.

Institution of Electrical Engineers.—Thursday, December 14th. At 8 p.m. Paper on "Residence Tariffs," by Mr. A. H. Seabrook.

Electro-Harmonic Society.—Friday, December 15th. At 8 p.m. At the Holborn Restaurant. Smoking concert.

Institution of Mechanical Engineers.—Friday, December 15th. At 8 p.m. Discussion on paper on "Double-cutting and High-speed Planing Machines," by Mr. J. H. Wicksteed.

Institution of Municipal Engineers.—Saturday, December 16th. At 3 p.m. At 4, Southampton Row, W.C. Paper on "The Electric Trolley Omnibus System," by Mr. Horace Boot.

THE ELECTRICAL ENGINEERS
(LONDON DIVISION).

Commanding Officer—COL. H. M. LEAF.

The following orders are issued :—

Monday, December 11th.—"A" Company. Technical work and musketry instruction (standard tests), 7 to 10 p.m.
Tuesday, December 12th.—"B" Company. Lecture, technical work and musketry instruction (standard tests), 7 to 10 p.m.
Wednesday, December 13th.—Gymnastic classes, 7 to 10 p.m.
Thursday, December 14th.—"C" Company. Lecture, technical work and musketry instruction (standard tests), 7 to 10 p.m.
Friday, December 15th.—"D" Company. Lecture, technical work and musketry instruction (standard tests), 7 to 10 p.m.
URGENT.—All members of the corps are requested to attend headquarters on their company night to sign Association Form 10, recently received from the County of London Association.

(Signed) P. H. CAMPBELL, Capt. R.E. and Adjt.,
For Officer commanding L.E.E.

NOTES.

Computing the Speed of Receiving a Telegraphic Message sent by Hand-key or by Automatic Transmitter.—For the above object, Mr. J. Rymer-Jones, M.I.E.E., describes in a short treatise just published a method for manual transmission founded on the only really reliable basis, viz., the actual number of elements received per minute, instead of on the calculated number based on some assumed mean number of elements per letter derived, as hitherto, from a very large number of words of newspaper phraseology, which does not equally apply to a telegraphic message, to code words, or to numerals, code signals, punctuation, &c.

The fact that this method determines the exact number of elements in the text puts hand-keying on the same satisfactory basis, in this respect, as automatic transmission*, and renders it equally suitable for any language expressible in the international or American telegraphic alphabets, for the official or abbreviated codes, and for a message containing only a few words or several hundred words. On this last account a speed calculation is very quickly made with the assistance of printed Form A. †

Although the speed of working is correctly represented by the number of elements per minute, its value in words per minute, of course, depends on the number of elements per word of the particular speed constant ‡ employed by different cable companies to suit their value of the dash, spacing and letter-word basis.

It is, however, obvious that the results so obtained are quickly interconvertible, being in an inverse ratio to the number of elements per word in their respective speed constants.

By adopting a recognised number of elements per word, say 40 elements per 5-letter word for siphon recorder, and 50 elements per 5-letter word for Morse recorder, the speeds of working on different cables become standardised and universally comparable.

An important advantage in the method is that the calculated speed is really that of the text itself and is not affected by inordinate spacing between words, due to hesitation in reading the text or to "rub-outs," because spacing between the words of the message is not included when determining the number of elements in the text, but is correctly allowed for in the formula.

The time factor in the formula is, moreover, not affected by bad spacing between words, as it is separately calculated by comparing the linear measurement of some 15 or 20 recorded words (or groups of figures)—selected for the speed computation, and arranged in an unbroken line—with the length of paper strip running during (say) 10 or 15 seconds.

In the description of the method will be found specimen slips of a siphon recorder and Morse recorder message, the speeds of which are both worked out in order to show how the required data are obtained and how the speed is evaluated from them by means of the formula.

Among other particulars as to various known methods for ascertaining the speed of messages automatically transmitted, the formation of signals by the perforated tape, speed-rate constants, &c., will be found a comparison as to speed efficiency between the international and American telegraphic alphabets under different conditions as to the length of the dash and spacing.

Electrical Developments in New Zealand. — Proposals for electrical development in New Zealand are rapidly being elaborated, and once or twice recently we have called attention to possibilities in the immediate future. The Public Works statement just introduced to the New Zealand Parliament by the responsible Minister of the Government contains some interesting details as to the proposals now under consideration. The conditions pertaining to the electrification of the Christchurch-Lyttelton railway are being investigated and the requirements ascertained. It is anticipated that with a supply of power available from Lake Coleridge the conversion from steam to electric working will be profitable, and tenders for the work will be invited in due course with a view to its completion as soon as possible after the supply of current becomes available. After the application of electricity to the working of this line, its application to other sections will be considered. In the meantime, all information on the subject is being collated, and the progress of electrification of railways in other countries is being carefully watched. In view of the rapid extension of electric working in France, Germany, Switzerland, Norway, United States and England, it is intended to make a systematic study of the traffic and train movements throughout New Zealand, with the object of ascertaining definitely the power requirements of the different sections. In other countries the electric working of railways, which has previously been limited to suburban services, is now being extended to main and branch lines, not only where the traffic is heavy, but also on lines with a comparatively infrequent service. Consequently the New Zealand Public Works Department is studying the application of electricity not only to suburban services, where its usefulness is undoubted, but also as an alternative to regrading, which is proving necessary on many of the main lines, in order to cope with the increasing traffic. The use of electric traction would dispense with the necessity of regrading in a great many cases, inasmuch as steeper grades can be worked with electric haulage, and at higher speeds than with steam engines. On new lines also it would be possible to reduce the cost of construction considerably, and to expedite the work by the adoption of higher maximum gradients than are possible with steam haulage, but which can be advantageously operated electrically.

The statement of the Public Works Minister also gives further details as to the hydro-electric works at Lake Coleridge and elsewhere. It appears that much preliminary work has been carried out in connection with the Lake Coleridge scheme. The available market for power in the Canterbury district has been investigated, and the requirements ascertained, and plans and specifications are in course of preparation for works to provide for an ultimate demand of 10,000 H.P.; tenders will shortly be invited for a first instalment of the plant. Arrangements are being made for completing the first section of the work in two years.

It is estimated that a capital expenditure of £375,000 will be required efficiently to install the full 10,000-H.P. plant, and that when installed the district between Rangiora in the north and Timaru in the south can be supplied with electrical energy, with branch lines to the different farming centres. It is hoped to make the system serviceable to country residents as well as to the inhabitants and industries of the cities and larger towns. For this there are very striking precedents in Switzerland, France and Germany, where farms and cottages in rural districts are supplied with electricity for lighting and power purposes at cheap rates. The estimates of capital outlay and operating expenses indicate that power can be supplied at about £6 10s. per H.P. per year for wholesale supply for distribution and for factories.

Although the Lake Coleridge system is the first in importance owing to the urgent demand for an adequate supply of power in the city and suburbs of Christchurch, other available sources of electrical energy are receiving attention. An investigation of the available market in the Whangarei district, where hydroelectric power is available from the Wairua Falls, has been made with satisfactory results, and preliminary steps are about to be taken for the development of power from these Falls, and from Lake Waikaremoana. The electrical engineer to the department is to visit both sources of supply at an early date. It is of fundamental importance for the future development of this work that the fullest possible information should be collected with regard to the rainfalls and variations in flow of the principal rivers over an extended number of years. This information is essential in order that as the population and the markets develop accurate and reliable estimates may be formed of the water power available to meet the demands. For this purpose gaugings will be undertaken of all rivers and streams which are likely to be put under control.

The actual estimates include £290.000 for the Lake Waikaremoana scheme, the Hutt River scheme, the Lake Coleridge scheme and the purchase of material; as well as £10,800 for surveys, &c. The total amount estimated to be required for the current financial year is £50,000.

Under the heading of "Telegraph Extensions" the following sums are included in the estimates:—New telephone exchange stations, £105,000; telephone extensions and new districts, £20,000; trunk wires, £25,000; wireless telegraphy, £7,500; wireless telegraph stations, £7,500.

Strike.—A number of electricians employed by MESSRS. CAMMELL, LAIRD & CO., LTD., at their shipbuilding yards, Birkenhead, came out on strike on November 23rd, in support of their demand for a higher rate of wages.

Some 70 men are involved in the strike, and in a statement issued by the company, it is stated that they consider the action of the men in going out on strike at present as most high-handed, and totally contradictory to the avowed policy of the principal Trade Unions that stoppage of work should not take place as long as negotiations are in progress. The electrical trade union forwarded to the firm on November 8th a long list of rules which would be adhered to by their members in their entirety after November 22nd. It is obvious that in a large works it is impossible to allow each small section to draw up rules for itself, especially as regards the hours that the men are prepared to work, and the firm replied to this effect, stating that there was no reason why electricians should be treated more favourably than the members of the many larger Trade Unions. The Union replied on November 16th that the question of the rate of pay was the most important item, and while a letter from the firm proposing a basis of discussion for the rate of pay was still unanswered, an ultimatum was received from the men that, unless the rate of pay they asked for was at once granted, the members would stop work on November 22nd. The rate asked for is stated to be 2s. to 3s. higher than the present rate in this or any other shipbuilding centre, the present rate here being 37s. per week. One of the principal features of the two agreements in the shipbuilding and engineering trades is that no negotiations can take place while a stoppage of work is in progress, and before negotiations with the electricians can be entered into they must first return to work.

Parliamentary.—PEEL-CONNER TELEPHONE WORKS.—Following up his previous question (given in last week's ELECTRICAL REVIEW), Mr. O'Grady asked whether the inspecting officer who inquired into the strike of girls at the Peel-Conner Telephone Works, Manchester, while the firm were carrying out a Government contract, asked the girls to submit their view of the trouble; and if not, would an inquiry be again undertaken, and the girls' evidence taken in the matter of the reduction in wages which caused the strike. The Postmaster-General replied that he found the girls who struck work were not asked to submit their views. He was sending an officer to make a further investigation, and would communicate the result to the hon. member.

* In automatic transmission the number of elements per minute equals twice the number of centre holes passing through the transmitter during that interval.

† Blank "Forms A," 24 in each pad, are obtainable at the ELECTRICAL REVIEW Office, 4, Ludgate Hill, E.C.

‡ Including the recognised allowance for spaces between words.

The City Lighting Scheme.—At the meeting of the Court of Common Council (City Corporation) on Thursday last week, Mr. J. Gunton, on behalf of the Street Committee, submitted a scheme for the lighting in about equal proportions by gas and electricity of the streets of the City, by means of centrally hung lamps as far as practicable for a period of 10 years, whereby an annual saving of about £6,800 would be effected, and an increase in illuminating power obtained of about 600,000 C.P., and recommended that the Gas Light and Coke Co. and the City of London Electric Lighting Co. be permitted to light the public ways in accordance with the said scheme, and that the Committee be authorised to carry out the arrangements, with power to settle all necessary details.

Mr. Gunton, chairman of the Committee, said in 1908 the Corporation appointed a deputation to visit certain Continental cities for the purpose of inspecting the various systems of public lighting. It visited Brussels, Cologne, Düsseldorf, Berlin, Dresden, Vienna, Munich and Paris, and found each of those cities better lighted than London. It had presented its report, and the Council authorised the Committee to arrange for experimental lighting, which had now been in operation for a long time and open to the inspection of the public. The lighting, which he believed had met with universal favour, included the lighting of the St. Paul's end of Cheapside by electric lamps of the Oliver make, fitted with dioptric lenses, and giving 3,000 C.P., and the lighting of King William Street end of Cannon Street by high-pressure gas lamps of 2,000 C.P. Such being the opinion of the experiments, his Committee proceeded to obtain tenders, but only two companies finally sent in prices, namely, the City of London Electric Lighting Co. and the Gas Light and Coke Co. After full consideration, neither company was willing to take a contract for the whole city, mainly on account of the initial cost of the plant, &c., as the whole cost for the complete installation was to be borne by the companies, the Corporation being simply called upon to give the necessary facilities for the work. Another reason why the Committee was in favour of dividing the contract was that it would not render it necessary to take up the streets, except for a very short distance, in laying gas mains where they did not already exist, which would have been almost impracticable, especially in busy centres. It was therefore arranged that both companies should confine their tenders to those portions of the City which they now light, as clearly shown on the plan. The figures submitted, which his Committee, after full consideration, advised the Council to accept for a term of 10 years, showed a cost for gas of £6,719 per annum, as against the present expenditure of £10,099, and for electricity £7,322, against £10,774 10s., being a total cost per annum of £14,041, as against £20,873, or a net annual saving of £6,831. The great point which he hoped would be appreciated was that they increased their lighting by 601,755 C.P., which meant almost doubling the light throughout the entire City. The improved lighting was not only in the main streets, but throughout the entire City. It was not possible everywhere to provide centrally hung lamps, but wherever possible that type would be used, the inverted burner making such lamps practicable.

The report was unanimously adopted.

Electric Time Service.—The example of Durban is about to be followed in Pietermaritzburg of momentarily lowering the electric light at 8 p.m., as an indication of the correct time. This has been done in Durban for about two years, with good results.

The Treasury and Applied Science.—A Blue Book has been issued by the Board of Education on the Universities and University Colleges in Great Britain. It contains over 700 pages, with a tremendous amount of tabulated matter concerning higher education in this country. It is here proposed to mention a few of the points found within this voluminous record which effect higher education in technology.

During the past year £200,000 was given to University College, Reading. Apart from that, the chief endowments provided by private benefaction during the last year have not been comparable with those made in the previous period. "The small extent to which University work is endowed by private benefaction," says the report, "in this country is emphasised if comparison is made with the measure of support forthcoming in other countries. Thus, within a year of its foundation, the Kaiser Wilhelm Society for the promotion of science in Germany has at its disposal a capital of half a million sterling, which is being devoted to the equipment of institutes at which men, already eminent in their respective subjects, will be installed. In France, Monsieur Auguste Loutreuil left a sum of £284,000 towards the promotion of science in that country. In the United States Mr. Rockefeller handed over the sum of £764,000," and so on. The report goes on to speak also of the apathy of the local authorities, several of whom give less than a fair share of support to University work.

So far as engineering work is mentioned, the most noticeable facts are (1) that at Bristol the University Engineering Department has been closed, and the work and staff amalgamated with those of the Merchant Venturers' College in the new buildings of the latter, now recognised as a constituent college of the University; (2) plans for buildings and equipment at Hartley College, Southampton, have been prepared—the cost of the work is estimated at £80,000, but it does not seem to have been raised, nor is the purpose of the extension explained; (3) the East London College, formerly the People's Palace Technical School (one of the earliest and most successful trade schools of this country), now obtains a Treasury grant as a University College. (In passing, it may be suggested that really good trade schools are still urgently needed. The closing of the Carpenters' School at Stratford and the change of work in technology at the institution in the Mile End Road, leave a gap which might well be filled by other institutions in the East End of London.)

Mention is made of the great need of co-ordination in London and elsewhere. London University seems to be at present paralysed by the Royal Commission. That has ever been its fate. Even this Report says nothing can be done until the recommendations of the Commission are published. The fifth annual Report of the British Science Guild contains rough comparisons between the numbers of properly-equipped day students attending the Technische Hochschulem in Germany and the numbers of day students doing similar work here. After making full allowance for the larger population in Germany, there are more than twice as many such students in Germany as in Great Britain and Ireland. It is considered that a more exact comparison would lead to results less favourable to this country.

A table included shows that nearly 33 per cent. of the income of English colleges is derived from fees, about 15 per cent. from endowments, a little more than 14·5 per cent. from local authorities, and 28 per cent. from the Exchequer. The total number of students of all kinds for 1909-10 was 22,187 in England, and of these only 8,174 were full-time students. There seems to be, roughly, some 700 or 800 engineering students attending lectures which lead to a degree, and as far as one is able to estimate the number of engineering graduates to be turned out per annum during the next two or three years, will be from 200 to 250. On the whole the Blue Book makes out a good case for endowment by private individuals. It does not say anything about the difficult problem of co-operation between the manufacturers and the Universities. That has been most successful in some places, and an utter failure in others. Possibly it depends very much upon the personalities of both parties. One of the best examples of such co-operation ever recorded, was that of Mather and Reynolds. It must have been of great intrinsic value to the former, who, be it remembered, generously looked after the engineering department of Owens College. And it possibly kept the attention of Reynolds fixed upon matters of applied rather than pure science.

We understand that the Treasury has now handed over the disposal of the money for university colleges to the Board of Education. We are not altogether satisfied—from the engineer's point of view—that sufficient attention is given to scientific equipment. As an example, we may mention the inspection of a university college, which quite recently took place. Although there are quite as many Science and Engineering students as in the Arts Faculty, yet there were three Arts authorities and only one Science man to decide upon the future of the place. We want science to permeate even into the officialdom of the Treasury.

Damage by White Ants.—An engineering correspondent in South Australia sends us particulars of widespread depredations effected by the so-called white ants (termites) in Adelaide, in connection with the telephone cables of the P.M.G.'s department. The occurrence of crosses between the circuits in a lead-sheathed cable, drawn into earthenware ducts, led to the withdrawal of the cable, when it was found that the sheathing had been partly eaten away in places for several inches, nearly the full thickness of the lead, and in many parts the ants had eaten right through the metal. The presence of living ants in the debris removed from the duct, and the identical nature of the damage with that known to be effected by them in timber, left no doubt whatever as to the cause of the trouble. It is feared that similar damage may be in progress in all parts of the area where underground cables are laid, and it has been suggested that carbon bisulphide may prove effective in putting a stop to it. Hundreds of miles of cable, it is said, have been laid underground, and if the damage is not stopped, enormous expense will be incurred.

In Sydney, some time ago, it was reported that electric light cables were being attacked by the ants, and our correspondent informs us that some three or four years ago it was found on the Sydney tramway system, where the cables were laid on the solid system, that the white ants got through the bitumen compound, and then attacked the lead sheathing, finally eating into the insulation of the high-tension cables, and breakdowns were caused as a result. The authorities decided that it was necessary to provide poison for the termites, and the bitumen in which the cables were laid was loaded with half an ounce of arsenious oxide per cubic foot of bitumen. The Adelaide tramways immediately followed the Sydney practice, as their high-tension transmission line and tramway feeders are laid on the solid system. Half an ounce of arsenious oxide was added per cubic foot of bitumen, and a thin layer was run along the top of the troughing after the main bulk of the bitumen had cooled off, this thin layer containing half a pound of arsenious oxide per cubic foot of bitumen.

It is astonishing how rapidly the white ant works. Some of the wood blocks laid in the main city street of Adelaide between the tram tracks, 2½ years ago, are absolutely riddled with white ants, in spite of the fact that the timber is jarrah (*Eucalyptus marginata*), which is supposed to be white ant-proof.

Electrical Trades Union.—At the Bush Hotel, Shepherd's Bush Green, W., Bro. John Potter will give an address on "Foreign Policy from the Workers' Point of View," Tuesday evening, December 12th, at 9 o'clock.

Colliery Fatality.—A correspondent says that a fatal accident took place at the United Collieries, No. 2 Pit, Nackerty, Uddingston. A haulage rope connected with the colliery electric plant became charged with electricity, and a young man who was in the vicinity came in contact with the rope, and immediately collapsed. Artificial respiration was resorted to, but was of no avail.

Indian Business Methods.—The following letter, received by one of our readers, is a remarkable example of *naiveté*:—

"Please send us by return of mail full details and particulars together with your very latest illustrated wholesale Price Lists of every one of your Specialities.

"We kindly point out that India and all other Countries in the East and in the Far East are most miserably cheap markets, so pray be quite sure to quote us your most liberal trade and cash discounts over and above your latest dreamable wholesale trade prices. Kindly quote as low prices as possible, but please state that you will allow us 50 per cent. trade and 5 cash discounts besides your cheapest conceivable prices. This will enable us to do quite a tremendous business with you if you write back agreeing to appoint us your Firm's exclusive representatives and sole agents in entire East and the Far East, since we have most exceptional trade connections and facilities in all these countries. Provided always that your goods prove to be 'quick sellers' we guarantee A1 business. Therefore please be quite sure to at once send us a totally free sample of every one of your various specialities. Pray do not fail to do this at once. Kindly also state that packing shall be free and that no charge shall ever be made for wooden cases. All our other Principals always do the same.

"Please also inform if you make *revolving hand fans* (of metals) in ladies' and gents' sizes. If yes, pray send a free sample of each at once, and quote lowest prices and highest trade and cash discounts.

"We would always expect you to print our own name and address only (but never yours) on all goods to our orders, just as all our other principals always do. We want you to do this, as we never let our customers and our competitors know who our principals are, or by whom our goods were made. If, then, you agree to print only our own name and address (but never yours) on all your specialities sent to us, we will do quite a brisk trade with you if your goods are quick-selling lines.

"Please do not fail to send free samples at once, and state if freight and duty will be payable by you or by us, and so oblige.—Yours faithfully, &c."

We may mention that the cost of samples of all the specialities of the addressee would amount to several thousand pounds.

Labour Unrest: Some Remedies.—At a special meeting of the Council of the London Chamber of Commerce held recently, Mr. Stanley Machin presiding, the report of the Special Committee appointed by the Council of the Chamber to "inquire into and report on the whole question of the causes and effects of the recent labour unrest and the proper remedies" was presented and adopted. The following are the conclusions and recommendations contained in the report: "That, apart from any questions relating to the methods by which employers individually or collectively may determine to carry on their business, remedies for labour unrest can to some extent be provided by legislation. The Committee, therefore, recommended:—

1. The repeal or amendment of Secs. 2, 3 and 4 of the Trades Disputes Act, 1906, with special reference to the provisions as to "peaceful picketing" and the limitation of the responsibilities of Trade Unions for damages incurred in respect of strikes organised by them.

2. The enlargement of the powers of voluntary boards of conciliation and arbitration under the Conciliation Act, so as to provide for the enforcement of awards and agreements made between employers and employed and the prevention of lockouts and strikes without due notice being given.

3. That effective provisions be made for the maintenance of law and order in the interests of the general community, and for the full protection of those willing to work, and that such further legislative action be taken as will secure freedom of labour and of commerce as well as the protection of life and property.

4. That the statutory monopoly now enjoyed by a privileged class of watermen and lightermen in regard to the navigation of barges and similar craft on the river Thames should be repealed in order to provide for the freer navigation of the waters of the Port of London.

5. That the foregoing recommendations be formally presented to His Majesty's Government with a request that effect should be given thereto at the earliest possible date.

6. That a copy of this report be sent to all members of both Houses of Parliament.

The Committee further recommended that employers of labour should be urged to federate in order to protect their mutual interests, and that the Chamber should give its approval to the proposal for the establishment of a volunteer police force.

Municipal Appointments.—A Cardiff paper says that 48 applications were received for the position of commercial manager of the Newport (Mon.) Tramways and Electric Light Works. It was decided to tabulate these for consideration at a special meeting. At a meeting of the Electricity and Tramways Committee, Ald. Fred Phillips declined to be re-elected as chairman, and said that he did not agree with the policy of the Committee in rearranging the managerial duties of the tramways and electricity undertaking. Mr. John Moxon was subsequently elected chairman, with Ald. Fred. Phillips as vice-chairman.

There were 87 applications for the post of borough electrical engineer at South Shields, at £400 per annum. A selection of six was made, and after these have been interviewed by the Electrical Committee and reduced to three, the Council will be asked to finally settle the matter.

The Electrical Treatment of Tobacco.—We have received from the Voltuma Co. samples of their cigarettes, some untreated, others treated with electricity, on a system patented by Mr. E. J. Lusby. There is certainly a marked difference between the cigarettes said to have been treated and those not so treated, in favour of the former. Details of the process are wanting, but from the leaflets accompanying the samples it appears that the patentees are somewhat confused as to its nature, for they speak of "electrified or ozonised tobacco." Now, ozone is not electricity, nor is it necessarily an electrical product. They say also that "the added ozone softens or sweetens the tobacco"; one may treat tobacco with ozone, but cannot permanently *add* ozone to tobacco, for it very soon ceases to exist as ozone. We are told, too, that well-known electricians have been consulted, and their opinions prove "that when a current of electricity with a greater current density than that required to decompose water is passed through the tobacco, ozone as well as oxygen and hydrogen are liberated"; this, of course, is pure nonsense, and no electrician worthy of the name would make such a statement. Whatever, therefore, may be the merits of the treated tobacco, it is evident that the patentee's ideas regarding the treatment are extremely crude.

Indian Notes.—Our Special Correspondent in India writes: The Calcutta *Statesman* says that the Mysore Public Works Department have begun operations on the Cauvery reservoir project. The river is to be dammed 9 miles above Seringapatam. The reservoir water will be used partly for irrigating a huge extent of land which now lies fallow, between the French rocks and Chemnapatna, and, besides, it is calculated that an extra 5,000 H.P. will be available for the electric supply works. It is estimated that fully 10,000 coolies will shortly be at work on the 100,000 ft. of dam starting on both banks of the river. The scheme is to be carried out departmentally, the establishment consisting of a superintending engineer, three executive engineers and seven assistants, for all of whom temporary quarters are to be built.

The new State electrical engineer, Mr. Beame, has commenced work on the Bangalore tramway scheme. It is proposed for the present to lay down 10 miles of track between the Fort, Frasertown, Basvanguti and Maleswaran. The system will be under the control of the Mysore Durbar, who have guaranteed a 4 per cent. return. The present available horse-power for this project from the Cauvery Falls is about 250, but when the reservoir above mentioned is finished, at least 5,000 H.P. will be available. Some of this will probably be used for tramways, and some for the electrification of the Mysore-Bangalore Railway.

Will.—The late Sir W. J. Crossley (founder of Crossley Bros., of Manchester), who died in October, left net personalty amounting to £578,286.

Institution and Lecture Notes.—Royal Institution.—At a general meeting on Monday the thanks of the members were returned to Mr. D. J. Blaikley for presenting to the Institution, from the bequest of the late Miss J. Barnard and at her express wish, a large volume of Faraday's containing engravings, portraits and letters.

The lecture arrangements before Easter include the following:—Prof. E. G. Coker, two lectures on "Optical Determination of Stress and some Application to Engineering Problems"; Prof. Sir J. J. Thomson, six lectures on "Molecular Physics." The Friday evening meetings will commence on January 19th, when Prof. Sir James Dewar will deliver a discourse on "Heat Problems." Succeeding discourses will probably be given by Prof. Bertram Hopkinson, Dr. J. Mackenzie Davidson, Dr. J. A. Harker, Rt. Hon. Sir John H. A. MacDonald, Mr. G. K. B. Elphinstone, Dr. W. J. S. Lockyer, Mr. F. Soddy, Prof. D'Arcy W. Thompson, Prof. Sir J. J. Thomson and other gentlemen.

Association of Consulting Engineers.—The inaugural meeting of the Association will be held at the Institution of Electrical Engineers on January 15th.

The Society of Engineers (Inc.).—A paper on "The Design of Tall Chimneys" was read by Mr. Henry Adams, M.Inst.C.E., on December 4th. Different rules are given for the sectional area, wind pressure, &c. The safe load in tension and compression upon various materials is given, and the desirability of an independent foundation is pointed out. Some useful notes are given upon combustion, with the temperature and bulk of the escaping gases, the force of the draught and the horse-power of the chimney. In an appendix the author gives the detailed calculations and a design for a chimney 150 ft. high and 4 ft. 3 in. internal diameter, including the concrete base and protection from lightning.

Mr. W. W. Lackie recently gave a lecture to the members of the Glasgow and West of Scotland Branch of the Smoke Abatement League dealing with "Electricity and the Smoke Problem." He said that there were over 37,000 H.P. of electric motors connected to the Corporation mains. This alone meant a serious contribution to the solution of the smoke problem, inasmuch as these motors had displaced scores of chimneys used for private steam plants, which were now scrapped. This was only an earnest of what would take place all over the city when the electric drive was universally adopted. The use of electricity for cooking would mean the abolition of 80 per cent. of the atmospheric pollution from domestic chimneys, and the domestic chimney was the largest contributor to the smoke problem. The substitution of the electric vacuum cleaner for the carper-sweeper, hand-brush and duster, and the cleaning of cutlery, silver, brasses, and boots, meat mincing and coffee grinding by means of an electric device called the "Electric Mary Ann," would solve the servant problem.

Australian Electrical Engineering Institutions.—For some months past proposals have been under consideration for the formation of an "Australian Institution of Electrical Engineers" by the amalgamation of the existing societies—the Electrical Association of N.S.W. and the Victorian Institute of Electrical Engineers. Difficulties, however, have been met with, and the whole scheme has had to be withdrawn for reconsideration and amendment.

The Institute of Metals.—The London meeting will be held at the Institution of Mechanical Engineers, Storey's Gate, Westminster, S.W., on January 16th and 17th, 1912. The President-designate (Prof. W. Gowland, F.R.S.) will deliver his inaugural address on the subject of "Copper and its Alloys in Early Times," and a number of papers will be read, including "Properties of Certain Copper Alloys at High Temperatures," by G. D. Bengough, M.A.; "Further Experiments on the Inversion at 470° C. in Copper-Zinc Alloys," by Prof. H. C. H. Carpenter, M.A., Ph.D.; "The Influence of Oxygen on Copper containing Arsenic or Antimony," by R. H. Greaves; "The Nomenclature of Alloys," by Dr. W. Rosenhain, B.A.; "Poisoned Brass, and its Behaviour when Heated in Vacuo," by Prof. T. Turner, M.Sc.; and a paper by Dr. Carl Benedicks, of the University of Stockholm, on a zinc-antimony alloy. Membership application forms can be obtained from Mr. G. Shaw Scott, M.Sc., secretary, Caxton House, Westminster, S.W. The third annual dinner of the Institute will take place on January 16th, 1912.

Inquiry.—A correspondent asks for the names of firms who undertake autogenous welding.

Appointment Vacant.—A chief assistant to the Professor of Engineering is wanted at the City and Guilds Technical College, Finsbury. Particulars of the post appear in our advertisement columns.

Nobel Prize.—The Nobel Prize for Physics will probably be divided between Profs. Wien and Planck for their researches in the radiation of heat.

Taxation of Motor-Cars.—In the House of Commons on November 30th, it was stated in reply to a question by Mr. Joynson-Hicks that the Chancellor of the Exchequer was taking steps to appoint a small Committee to consider the existing regulations for calculating the horse-power of motor-cars for taxation purposes.

Charge of Stealing.—At Wolverhampton, on Monday, a number of men were committed for trial, several of them being allowed out on bail, on a charge of stealing and receiving tin ingots, of the value of £90, the property of the Electric Construction Co., Ltd.

Heavy Damages for Sunderland Shipbuilders.—After many days' hearing, the Official Referee, Mr. Edward Pollock, gave judgment in the action of Doxford & Sons, shipbuilders, of Sunderland, against the Wearmouth Coal Co., also of Sunderland. It will be remembered that the plaintiffs claimed damages amounting to £190,000 against the defendants owing to subsidence of land on which their shipyard, electric cranes, and workshops were situated, caused by the defendants' colliery workings. The learned Referee was asked to assess the damages. In giving judgment, he said that some of the particulars of plaintiffs' claim were exaggerated, but held that they were entitled to a sum of £102,276, carrying interest at the rate of 4 per cent. from the day of the judgment in respect of expenses of restoration, loss of profit, &c. He also awarded them $\frac{9}{10}$ths of the costs and granted defendants a stay of execution, in order that they might have an opportunity of considering his judgment.

For Sale.—The Hammersmith B.C. has for disposal by tender a quantity of plant, scrap metal, &c. See our advertisement pages to-day.

Labour Troubles in Berlin.—The Berlin correspondent of the *Standard* states (December 1st):—"For some time past large numbers of workers in all branches of the metal trade have been on strike, and following on the failure of negotiations, the Masters' Union last night decided on a general lock-out. Over 60,000 iron-workers, electricians, engineers, tinplate makers, &c., are now on the streets, and great firms like Siemens and Schuckert and the General Electric Co. are practically at a standstill."

The Royal Train in India.—With reference to our last week's notice under this heading, Messrs. J. Stone & Co., Ltd., write stating that the Royal train for the use of their Majesties the King and Queen, which has been built by the East Indian Railway, is fitted with their electrical installations. "The Royal train referred to, belonging to the Rajputana Malwa Railway, is also fitted with Stone's dynamos which provide the electric light while the train is in use, but in view of the special and abnormal conditions—that is to say, the long stop this train will make at the Durbar celebrations, when the train will, in fact, be used as an hotel—the petrol set has been supplied to charge the cells during the period the train is stationary."

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the Electrical Review *posted as to their movements.*

Central Station Officials.—The Brighton T.C. is recommended, owing to the resignation of Mr. Fowler, electrical engineer, to re-arrange the staff at the electricity works, and to appoint Mr. Caughton, at present on the staff, as assistant engineer and second in command under Mr. Christie, in connection with the engineering side of the undertaking, his salary to be increased from £300 to £350 per annum, with yearly increments of £25 to £400; and that Mr. Joyce, who has been on the staff for 20 years, be appointed assistant manager, his salary to be increased from £250 to £300, rising by £25 a year to £350.

The E.L. Committee of Derby T.C. has recommended that the salary of Mr. T. P. Wilmshurst, electrical engineer, be increased from £600 to £650 per annum, with a further increase to £700 on January 1st, 1913.

The *British and South African Export Gazette* says that Mr. W. J. Mason, who was for some years town engineer of Uitenhage, has been appointed to a similar position at Bulawayo, while Mr. R. H. Molesworth, late resident engineer to the Oudtshoorn Electric Light and Power Co., Ltd., was recently selected for the Uitenhage post.

The Bispham Council has appointed Mr. S. J. Hollinrake, of Hebden Bridge, to the position of electrical engineer.

General.—Mr. George Paton has resigned his position with the Tientsin Gas and Electric Light Co., Ltd., after serving them for three years as chief engineer of the station, and has taken up a position with the British American Trading Co., of that port, as manager of their electrical engineering branch, they being sole agents for the General Electric Co., Ltd., of Witton, with a head office for the Far East in Shanghai.

The *Review of the River Plate* states that Mr. V. Lindop, general manager of the River Plate Electricity Co., left last month for a short business trip to England.

The Council of the Liverpool University has appointed Mr. J. F. Gill, M.Sc., B.Eng., to be a demonstrator in Electrical Engineering.

Mr. George New, of the Indo-European Telegraph Department, has been appointed Administrator of the Persian Telegraphs.

Obituary.—Mr. J. F. Hall.—We deeply regret to learn of the death, which occurred on December 3rd, of Mr. James Frederick Hall, who had for many years been associated with Messrs. W. T. Henley's Telegraph Works Co., Ltd., in connection with submarine cable work. The deceased gentleman was 60 years of age, and had been ailing for some months. He entered the service of the late Mr. Henley as long ago as 1865—and the whole of his working life was spent continuously and faithfully with the firm. For many years he had occupied the position of chief of the electrical department, and he was holding this office right up to the time of his death. Naturally, therefore, he had had to play the principal part in connection with the manufacture and laying of many submarine cables, included among them being the following:—La Guayra and Caracas; San Domingo to Curacao; Puerta Plata to St. Nicholas Mole, Hayti; Cay Manera, Cuba, to St. Nicholas Mole, Hayti; Aquadores, Cuba, to Cay Manera; Halifax, Nova Scotia to Bermuda; Port-au-Prince to St. Nicholas Mole, Hayti; Martinique to Surinam; Bahamas to Florida; and Gotland. In our early days we were for many years intimately associated with submarine cable testing, and it was our good fortune to work on numerous occasions with Mr. Hall, for whom we have ever entertained the highest regard and esteem. From a humble beginning, and without any pretence to education, he rose by his own efforts to the position he occupied at the end, and we invariably found him to be a man in whom we could place absolute reliance.

The funeral of the late Marquess of Tweeddale took place at Yester, Haddingtonshire, on November 30th. At a memorial service held at St. Columba's, Pont Street, London, those present included Sir J. Denison Pender, Sir J. Wolfe Barry, Sir J. C. Lamb, Sir Henry Mance, and Mr. A. R. Hardie (Secretary of the Eastern Telegraph Co.).

NEW COMPANIES REGISTERED.

Kent-Mitchell, Ltd. (118,721).—This company was registered on November 22nd, with a capital of £600 in £1 shares, to acquire from A. R. Mitchell and G. P. Kent (1) foreign and Colonial patents for an invention known as the "Multiplex Advertising Machine;" (2) the benefit of a British patent for an invention relating to improvements in electric fittings known as the "Lazilite"; and (3) the benefit of a British patent for an invention relating to improvements in gearing known as the "Kent Mitchell Gear," to develop and turn to account the same, and to carry on the business of electrical, mechanical, motor and general engineers. The subscribers (with one share each) are:—A. R. Mitchell, Southampton House, High Holborn, W.C., engineer; G. P. Kent, Southampton House, High Holborn, W.C., director. Private company. The number of directors is not to be less than three or more than seven; the first are A. R. Mitchell, G. R. Kent and A. D. Mitchell; qualification, £10. Registered by Jordan & Sons, Ltd., 116, 117, Chancery Lane, W.C.

Thos. E. Morgan, Ltd. (118,687).—This company was registered on November 20th, with a capital of £100 in £1 shares, to carry on the business of electrical, gas, mechanical and general engineers, light, heat and power suppliers, ironfounders, plumbers, glaziers, &c. The subscribers (with one share each) are:—T. E. Morgan, 367, Ecclesall Road, Sheffield, electrical engineer; H. Allsopp, 163, Devonshire Street, Sheffield, traveller. Private company. The number of directors is not to be less than two or more than five; the first are T. E. Morgan and H. Allsopp. Registered by the Midland Mercantile Association, Ltd., Albert Buildings, 151-7, Fitzwilliam Street, Sheffield.

Oswald Carr, Ltd. (118,798).—This company was registered on November 27th, with a capital of £500, in £1 shares, to carry on the business of electrical, mechanical, hydraulic, constructional and general engineers, dynamo manufacturers, contractors, wagon makers, &c. The subscribers (with one share each) are:—J. Draper, 169, Parkside Road, Bradford, cashier; J. W. G. Butterfield, 2, Darley Street, Bradford, chartered accountant. Private company. The number of directors is not to be more than five; the first are O. Carr (managing director) and Gertrude Carr; qualification, one share. Registered office, Oak Works, Headingley, Leeds.

Harvey Electro-Chemical Co., Ltd. (118,778).—This company was registered on November 25th, with a capital of £25,000 in 23,000 preference shares of £1 each, and 40,000 ordinary shares of 1s. each, to carry on the business of contractors, founders, metal depositors, refiners and inlayers, electroplaters of metals and other substances, electrical engineers, gold and silversmiths, to acquire the businesses of the Metal Depositing Syndicate, Ltd., and the Alexander Harvey Exploitations, Ltd. The subscribers (with one share each) are:—C. Bowen, 25, Ely Place, Holborn, E.C., solicitor; E. A. de Buriatte, 25, Ely Place, Holborn, E.C., solicitor. Private company. The number of directors is not to be less than three or more than seven; the first are Sir William B. Hudson (chairman), Major H. de L. Walters, H. A. Harvey and Q. Marino. H. Harvey is permanent; qualification (except first directors), 250 shares; remuneration, £200 each per annum. Registered office, Norfolk House, Lawrence Pountney Hill, E.C.

National Ottoman Syndicate, Ltd. (118,864).—This company was registered on November 30th, with a capital of £55,000 in 50,000 preference shares of £1 each and 100,000 ordinary shares of 1s. each, to acquire, construct, complete, equip and maintain and work and finance the acquisition, construction, completion, equipment, and working of railways and other appurtenances, tramways, lines of telegraph, telephones or other means of communication in the Turkish Empire or elsewhere (except in the case of telephones and telegraphs in the United Kingdom), to generate, accumulate, supply and use electricity for light, heat, motive power or otherwise to acquire lands, mines, minerals or other property, to carry passengers and goods, to act as concessionaires, capitalists, financiers, &c. The subscribers (with one share each) are:—P. H. Wiggins, 141, Station Road, Church End, Finchley, clerk; R. C. Howley, 11, St. Anne's Road Leytonstone, clerk. Private company. The number of directors is not to be less than two or more than nine. The subscribers are to appoint the first; qualification, one share; remuneration, £200 each per annum (chairman £300.) Registered by Ashurst, Morris, Crisp & Co., 17 Throgmorton Avenue, E.C.

North-Eastern Electric Smelting Co., Ltd. (118,843).—This company was registered on November 29th, with a capital of £25,000 in 24,750 preferred ordinary shares of £1 each and 5,000 deferred ordinary shares of 1s. each, to carry on the business of electric and general smelters and refiners, &c.., and to adopt an agreement with O. Stalmann. The subscribers (with one preferred ordinary share each) are:—F. H. Haviland, 15, Old Christchurch Road, Bournemouth, solicitor; C. D. Willard, Cromwell House, Surrey Street, Strand, W.C., gentleman. Private company. The number of directors is not to be less than three or more than seven; the first are F. H. Haviland, C. D. Willard and F. M. Sanders; qualification, £100 preferred ordinary or £5 deferred ordinary shares; remuneration, £100 each per annum and 5 per cent. of the net profits in any year when 10 per cent. dividend is paid on the preferred ordinary shares (such remuneration not to exceed £250 for each director). Registered office, Cromwell House, 6, Surrey Street, Strand. W.C.

Dynamic Thermometer Co., Ltd. (118,790).—This company was registered on November 27th, with a capital of £1,000 in £1 shares, to take over the business of automatic temperature regulating experts, manufacturers and consultants carried on at 11, The Terrace, Barnes, as the "Dynamic Thermometer Co.," and to adopt an agreement with H. S. Benson. The subscribers (with one share each) are:—W. G. Hollinworth, 124, Wrottesley Road, Harlesden, N.W., gentleman; W. V. Harman, 25, Craven Park Road, South Tottenham, N., clerk. Private company. The number of directors is not to be less than two or more than three; the first are H. S. Benson and J. Stuart. Registered office, 11, The Terrace, Barnes.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

New Phonopore Telephone Co., Ltd. (44,654).—Charge on freehold land at Hayes, Southall, with factory thereon, dated November 14th, 1911, to secure £500, and all moneys for which A. Haes, A. F. Liddell and F. C. Liddell may become liable under a guarantee to Barclay & Co., Ltd., securing an overdraft up to £2,000. A memorandum of satisfaction to the extent of £300 on December 18th, 1908, and to the extent of £500 on October 17th, 1911, of charge dated September 10th, 1906, securing £2,500, has also been filed.

Electrician Printing and Publishing Co., Ltd. (26,898).—Mortgage debenture dated November 7th, 1911, to secure £1,000, charged on the company's undertaking and property, present and future, including uncalled capital. Holders: Coutts & Co., 440, Strand, W.C.

Newtons, Ltd.—Return dated September 27th, filed October 25th, 1911. Capital, £40,000 in £10 shares. 3,265 shares taken up. £18,650 paid. £14,000 considered as paid. Mortgages and charges: £13,000.

Warren Beattie, Ltd. (70,585).—Return dated September 11th, filed September 18th, 1911. Capital, £10,000 in £5 shares (400 deferred). 400 deferred and 796 ordinary shares taken up. £5 per share called up on 460 ordinary. £2,300 paid. £3,680 considered as paid on 396 ordinary and 400 deferred. Mortgages and charges: £4,000.

Marconi International Marine Communication Co., Ltd. (65,759).—Particulars of £250,000 debentures, created July 17th, 1911, filed pursuant to Sec. 93 (3) of the Companies (Consolidation) Act, 1908, the amount of the present issue being £125,000. Property charged: The company's undertaking and property, present and future, including uncalled capital. No trustees.

Melksham Electric Supply Co., Ltd. (118,263).—Debenture dated November 14th, 1911, to secure £400, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: W. H. Bell, Melksham.

Corona Lampworks, Ltd. (116,327).—Issue on November 9th, 1911, of £500 debentures, part of a series of which particulars have already been filed.

Switchgear & Cowans (1911), Ltd.—Particulars of £3,500 debentures, created October 27th, 1911, filed pursuant to Sec. 93 (3) of the Companies (Consolidation) Act, 1908, the amount of the present issue being £3,500. Property charged: The company's property, present and future, including uncalled capital. No trustees.

CITY NOTES.

German Electrical Companies.

The Siemens Elektrische Betriebe, of Berlin, which own or manage electric supply works established by the Siemens & Halske Co., report an increase of £5,500 in the gross profits for 1910-11. The net profits amounted to £28,700, as compared with £28,400 in 1909-10, and it is proposed to pay a dividend of 6½ per cent., being the same rate as in the previous year.

The accounts for 1910-11 of the *Helios Electricity Co., of Cologne*, which is in liquidation, show net profits from interest which permit of the reserve fund being increased from £158,000 to £163,000. On the other hand, the debit balance remains unchanged at £419,000, or the total amount of the ordinary share capital. The claims of the debenture-holders have been reduced from £345,000 to £268,000, and a further repayment of 14 per cent. is held in prospect for the beginning of next year.

The Telephonfabrik A. G. vorm. J. Berliner, of Hanover, after making the usual provision for depreciation and reserve funds, proposes to pay a dividend of 8 per cent. for 1910-11, as contrasted with 12 per cent. in 1909-10, 11 per cent. in 1908-9, 10 per cent. in 1907-8 and 9 per cent. in 1906-7. It is said that the less satisfactory results are partly due to the reduction in the orders received by the Vienna branch from the Austrian military authorities, who placed large contracts during the crisis incidental to the annexation of Bosnia and Herzgowina, and to the expenses which arose from the subsequent conversion of the Hungarian branch into an independent company.

The report of the *Bayrische Stickstoff Werke* (*Bavarian Nitrogen Works*) for 1910-11 refers to the third preparatory year of the company's existence. It states that all the constructional works were completed at the end of April, 1911, when production was partially commenced. The plant worked satisfactorily and yielded a good marketable product, and the advantages of nitrogen of lime as a fertiliser were being recognised by agriculturists to an increasing extent. The demand was so large that the entire output had been sold to the spring of 1913. The accounts show that including the deficit brought forward, the year 1910-11 closed with a loss of £3,400, which has been carried forward.

The A.E.G.-Lahmeyer Werke, Aktien Gesellschaft, which was formed by the Berlin A.E.G. in 1910 for the purpose of taking over the Frankfort dynamo works, reports profits of £32,000 for the first half of 1911. After allocating £2,380 to depreciation of buildings and £926 for management expenses, the accounts show net profits of £28,800. It has been decided to pay a dividend at the rate of 6 per cent. for the six months on the ordinary share capital of £500,000, the whole of which is held by the Berlin A.E.G., and to place £12,500 to a special reserve fund, leaving a balance of £1,360 to be carried forward. The ordinary reserve fund, which was created on the formation of the company, stands at £50,000, and the credits open with the A.E.G. and the banks are returned at £411,000.

The Elektrizitats Gesellschaft Colonia is the title of a new company which has been formed at Cologne to take over and continue the undertaking of the E. H. Geist Electricity Co., which went into liquidation a year ago. The enterprise is being acquired according to an agreement which was approved at a meeting of the Geist Co. last September, and which is on an annual rental basis with the option of purchase. It is intended to supplement the existing equipment by the installation of modern labour-saving machinery, to retain the existing staff of workmen and to take over the incompleted orders on hand on January 1st, 1912, the works having hitherto been continued by the liquidation company, whose financial position has experienced a further improvement since last June.

R. Waygood & Co., Ltd.—The directors have declared an interim dividend at the rate of 5 per cent. per annum (6d. per share), less income-tax, on the ordinary shares for the year to September 30th.

J. G. White & Co., Ltd.—The directors have declared an interim dividend, payable January 1st next, of 6 per cent., less income-tax, for the half-year to August last, on both the preference and ordinary shares. This interim dividend is 12s. per share on the preference shares, against an interim dividend of 10s. per share paid last year.

Power Gas Corporation, Ltd.—A dividend of 4 per cent. on the ordinary shares for the year ended September 30th is announced.

Melbourne Electric Supply Co., Ltd.—The directors have declared a dividend of 2½ per cent. on the ordinary stock for the year ended August 31st. £7,000 is placed to depreciation and general reserve, £6,000 to extinguish suspense account, and £5,300 is carried forward.

The Siemens and Schuckert Companies.

As will be seen from the following financial statements, the Siemens-Schuckert group of companies realised larger net profits from the favourable course of business in the 12 months ended with June, 1911, than in the preceding year, although only two are declaring higher dividends than in 1909-10:—

The directors of the Siemens & Halske Co. announce that the balance-sheet for 1910-11 shows net profits of £616,000, as compared with £575,000 in the preceding year. It is proposed to pay a dividend of 12 per cent., being the same rate as in 1909-10; to place £110,000 to the special reserve fund, as against £75,000, and £17,500 to the disposition fund, the same as in the previous year; to allocate £40,000 to bonuses to staff and workmen, as compared with £35,000, and to carry forward £54,000, as against £53,000 in 1909-10. The dividend is distributed on a share capital of £3,150,000, and the same rate was also paid in in 1908-9, and 11 per cent. in each of the two preceding years on a capital of £2,725,000.

The financial statement of the Siemens-Schuckert Works, whose share capital of £4,500,000 is held in almost equal halves by the Siemens & Halske Co. and the Schuckert Electricity Co., of Nuremberg, indicates net profits of £671,000 for 1910-11, as contrasted with £530,000 in the previous year. It is intended to distribute among the proprietary companies a dividend of 10 per cent., or at the same rate as in 1909-10. The sum of £125,000 has been set aside to form a new reserve fund; £65,000 has been devoted to bonuses to staff and workmen, as against £50,000 in 1909-10; £17,500 has been placed to the disposition fund as in the preceding year; and £14,000 has been carried forward, as against £12,600 in 1909-10.

The accounts of the Elektrizitäts Gesellschaft vorm Schuckert and Co., of Nuremberg, exhibit gross profit of £362,000 for 1910-11, as compared with £326,000 in 1909-10, these being exclusive of the amounts of £61,000 and £60,000 brought forward in the two years respectively. After applying £123,000 to management expenses, interest charges, taxes, and the usual provision for depreciation, as contrasted with £119,000 in 1909-10, the sum of £7,500 has been placed to the coupon tax reserve fund, leaving net profits of £293,000, as against £260,000. The special reserve fund absorbs £15,000, as compared with a similar sum in 1909-10, and the directors' fees and profit share of managers and officials amount to £10,300 as against £7,470. The balance allows of the payment of a dividend of 7½ per cent. on the old share capital of £2,500,000, as contrasted with 7 per cent. in 1909-10, and at the same rate on the new shares of £500,000 for six months, leaving £62,000 to be carried forward.

The Rheinische Schuckert Gesellschaft fur Elektrische Industrie, of Mannheim, after making increased provision for depreciation and reserve funds in 1910-11, as compared with the previous year, contemplates the payment of a dividend of 7½ per cent., as contrasted with 7 per cent. in 1909-10.

British Columbia Electric Railway Co., Ltd.

Mr. R. M. Horne-Payne presided on November 30th at the Great Eastern Hotel, E.C., over the fifteenth ordinary general meeting of this company.

The Chairman, in moving the adoption of the report (see Electrica Review, page 915), said the accounts were so plain that they did not require any explanation from him. He had during the past six months received a number of inquiries regarding the general prosperity and future prospects of the company. In regard to the negotiations which were started by the Council of Vancouver City with a view to inducing the company to agree to their suggestion respecting the date when the City of Vancouver first had the right to purchase the railway, some of the representatives of the city wished to introduce into the bargain conditions which would have given to the City Council a right to unduly intervene and control the service given by the company. They were satisfied that this would have led to constant disputes, and to a thoroughly unsatisfactory and uneconomical service. They fully recognised the right of the Council to voice the interests and the complaints of the public as regarded the service they gave, but between this and actually giving the Council a share in the right and responsibility of spending their money, there was a wide difference. They wanted to meet the needs and advance the interests of the cities they served in every way possible. They had not spared either energy or money in their efforts; they had spent $25,000,000 on the task, but they could not part with the right of freely deciding for themselves how their money was to be spent, and how interest was to be earned upon it. The old City of Vancouver covered only a comparatively small part of the greater city or group of municipalities, commonly spoken of as Vancouver. Their rights to operate the railway outside the old city's limits were in some cases perpetual, and in no case for less than 36 years still to run. The Corporation of Vancouver had the right in 1919, and at the end of each successive five-year period, to buy most of the railway property within the old city limits on the conditions set forth in the report. Whether they would exercise that right or not for many years to come he did not know. If they had the right to-day, they undoubtedly would exercise it, because the advocates of municipal ownership of public utilities were just at present very numerous and very loud-voiced in Canada. Personally, he held the opinion that the city would not buy in 1919 or for many years, because he believed that by 1919 the ratepayers in some of the eastern cities of Canada, who were now experimenting in municipally-owned electric undertakings, would have had such a lesson that Vancouver ratepayers would not be anxious to follow in their footsteps. Already, he knew of at least one city in the east where the inhabitants were waking up to an unpleasant suspicion that, in consequence of municipal ownership, their rates were likely to go up by leaps and bounds, that they had already paid out huge sums, were called upon to pay double and treble the sum originally estimated, and had very little to show in return, and that, moreover, they were paying three times over for their public utilities, once in the direct charge, and twice over again in the shape of increased rates. He did not think Vancouver would want to buy out the city lines in 1919, but whether they did or not would not be a matter of vital importance to them, because he believed that, by 1919, there would be six or eight municipalities surrounding the old city, each as populous as the old city is to-day, and instead of serving a population of 250,000, the railway would be serving a population of between 450,000 and 550,000. He thought, moreover, that, in the long run, the company would be glad that the recent negotiations with the city came to nothing. They would have involved them in a large loss of revenue for seven years, in some gain of revenue for the next 14 years, and in an enormous loss for the remaining 17 years. The chairman proceeded to refer to the somewhat irregular and inadequate service given by the company during the spring and summer, which arose from the unprecedented rapidity of the city's growth, which made it utterly impossible for the management to keep pace with the work, and rearrange the organisation fast enough to meet constantly changing conditions. The increase in business was still going on at the same marvellous pace, but they were now better organised to meet the strain, and he hoped that the public would be well served in the future, and that complaints would cease. There was one other point that, perhaps, he had better mention as a matter of precaution. Just at present it seemed possible that, during the next 12 months, they might be compelled by some of their competitors to fight for some of their business by reducing some of their charges for light and power. There was no sound reason for this, as their charges were already exceedingly low, considering local conditions, and if their competitors would only show a reasonable amount of patience, there would be plenty of good business at remunerative prices for all. They would not be the aggressors, but if it pleased their competitors to try and steal their business by selling light and power below the cost of production, they would not sit still and allow them to do so, but would meet cut by cut, strong in the knowledge that it was only a small portion of their business that could be affected, that they could produce power at a lower cost than they could, and that they had large financial reserves accumulated to meet just such a contingency as this. He mentioned this matter in order that they might be forewarned. They must not be alarmed should they notice a halt in the increase of profits during the coming year. They might rest assured that this was only a passing condition which could be only temporarily of a serious nature, and that at the worst it was unlikely to cause them more injury than possibly to prevent them adding to their reserve fund for a year or two at the outside. In conclusion, the Chairman said that Canadian finance had up the present remained exceptionally sound and exceptionally clean, and comparatively few unsound enterprises had been floated on this market, but a year or two ago several utterly wild schemes were unfortunately taken up in this country, and the time was now about due for them to come to grief. He warned them that if two or three Canadian ventures failed to pay their interest and went into the Bankruptcy Court, they should not let it affect their judgment of other enterprises, and be scared into selling their securities and shares in any other Canadian companies simply because a few rotten, ill-conceived ventures came to grief.

Mr. E. M. Harvey seconded the motion, and the report was adopted.

A resolution was carried recommending dividends at the rate of 6 per cent. for the year on the preferred ordinary stock, and 8 per cent. on the deferred ordinary stock.

Mr. H. Brown proposed that the best thanks of the meeting be given to the staff for their loyal and successful efforts. He said he was in Vancouver for over two months during the year, and came into close personal touch with the general manager and the chief members of the staff, and he could say from personal knowledge they had a staff as zealous in the interests of the company as it was possible to get.

The motion was carried, and a vote of thanks was accorded the board.

Subsequently the meeting passed a resolution increasing the capital of the company to £4,000,000 by the creation of 800,000 new shares of £1 each.

Adelaide Electric Supply Co., Ltd.

Mr. J. B. Braithwaite (chairman) presided on Monday at Finsbury Pavement House, E.C., over the seventh annual general meeting of this company.

In moving the adoption of the report (see Electrical Review, page 914), the Chairman said that the board had again a very satisfactory balance-sheet to put before the shareholders, due largely to the continuance of the load from the Tramway Trust long beyond the period which they had anticipated, and combined with that was a most gratifying increase in their own consumers in the various districts around Adelaide. The manner in which they were discharging their obligations under their Act, must, he thought, be gratifying to the South Australian Government, for they were not sparing expense, or the taking of commercial risk, in order to give a supply of electricity in any district within a comparatively easy reach of Adelaide where there was any reasonable demand at all. They were now supplying in 104 sq. miles, with a population of 176,861, and polls were being taken in other districts, and if

these were favourable the mains would be still further extended. Therefore it would be seen that they were fully carrying out their responsibilities to give an effective supply of electricity, both for lighting and power. This necessarily required a steady expenditure of capital, and during the past year they had spent a further sum of £52,553 on capital account. If they turned to the balance-sheet it would be seen how that capital had been supplied. The ordinary capital had been increased by 100,000 ordinary shares, but none of that additional capital had yet been issued, but was available for issue when required. They had, however, during the year exercised their borrowing powers to the extent of £100,000. They came to the conclusion that the most economical way to raise the capital required was to issue debentures, and this had been done, and they were now quoted on the London Stock Exchange at about 105. They had a further £50,000 of debentures available for issue when required. This issue of £100,000 debentures enabled them to meet the capital expenditure he had referred to, and leave them with £55,703 cash in hand. They had also made a commencement of the investments on behalf of the dividend equalisation account by purchasing £5,000 Metropolitan District and London Electric Railway Joint Power House 4 per cent. rent charge stock, partly paid, and £2,500 London Electric Railway 4 per cent. preference stock fully paid. These items stood at £4,643. Since the date of the balance-sheet, the Power House stock had been fully paid for, and they had also invested £2,500 in the purchase of Southern Nigeria 4 per cent. bonds, so that they had now £10,000 invested on behalf of the dividend equalisation fund. They thought it prudent to invest a portion of the fund in liquid securities, which should be available if necessary. The cost of the undertaking had naturally gone up by the amount spent on it, and now stood at £382,974, against £340,000 odd. Turning to the profit and loss account, it would be seen that they had had another very prosperous year. They received £30,841 for the supply to the Municipal Tramway Trust, but that revenue had now entirely ceased. The continuance of the supply so long was quite unexpected by them, and they were placed in very considerable difficulty in order to meet the demand. However, they were able to tide the Trust over a period of difficulty. The Chairman proceeded to read extracts of speeches by the Premier and by Mr. Goodman, the tramways manager, in which both speakers eulogised the services rendered by Mr. F. W. Clements, the local managing director, and Mr. F. W. Wheadon, the engineer of the company, which enabled the Tramways Trust to run their cars much sooner than they could otherwise have done. He added that it was gratifying to know that the connection with the Municipal Tramways Trust had ended in a friendly manner on both sides, and that the company were now able to devote their energies to meeting the demands of their own tramways. Of course, the most gratifying feature of the year was the increase in the number of consumers and in the revenue. They had received £36,476 for lighting, against £29,339, and the revenue from power had increased from £10,324 to £14,140. Public lighting was £2,405, against £1,941, and meter rents £1,520, against £1,097. The result was that they had a gross revenue of £86,347, against £75,598 last year. On the debit side, generation had cost £25,791, against £21,984, distribution £2,791, against £2,535, and repairs and renewals £5,914, against £3,374. Interest on debenture stock accrued, £1,250, was a new item, and would figure more largely in future years. It was proposed to pay the usual 6 per cent. dividend on the preference shares, and a final dividend of 6½ per cent. on the ordinary shares, making 10 per cent. for the year, together with a bonus of 2s. per ordinary share. They transferred £5,000 to the general reserve, against £1,000 last year, and added £5,000 to the equalisation of dividend fund, which brought that fund up to £20,000, which they thought was sufficient, and they would carry forward £4,385. He ought to have said that the increase in their lighting during the year had been 34,880 30-watt lamps, and in power of 885 H.P., and the increase was still going forward very rapidly. The last information they had, showed that applications were still pouring in, nor was this to be wondered at, because the introduction of the metallic-filament lamp had practically reduced the price of electric current by two-thirds. Some people might have said that that being so the company might have raised their price from 6d. to 8d., and that then the consumers would have benefited, but they felt it better policy to give the full benefit of the economy to the consumers. He thought there was every reason to suppose that as the advantages of electricity became better known they would get a constantly increasing demand, which would, of course, mean a steady increase in their revenue. As to the future, they must bear in mind that they would have no revenue from the Tramway Trust, and how far that loss of revenue would be met by an increase in their private consumers remained to be seen. They could not expect to show such a balance-sheet next year, although he hoped they would continue to show steady improvement in all their normal supplies. Of course, they would make some economies in generation expenses, owing to not having to supply the Tramway Trust, and he thought they would be able to show a satisfactory balance-sheet.

Mr. R. P. Sellon seconded the motion.

Mr. Ashton asked what amount the directors proposed to put to depreciation, or was the amount standing under the heading of repairs and renewals considered sufficient.

The Chairman said they were putting £5,000 to the general reserve. They did not ear-mark it for depreciation specially.

Mr. Brookman thought the remarks of the chairman might give the impression that the company would not be able to maintain the 10 per cent. dividend, and he would like him to make the address quite clear. He gathered from the figures before them that the normal advance of the company during the year had been something like 30 per cent., and he would like to know if that progress had been maintained during the three months since the year closed. If it was being maintained, then it seemed to him there would be no difficulty in maintaining the dividend which the absence of the sale of units to the Tramway Trust might otherwise endanger.

The Chairman said Mr. Brookman was right as to the rate of increase of business during the year. He did not know that he could say much more than he had with regard to the future.

Mr. Brookman said they might have some estimate of the amount of profit made on the sale of units to the Tramways Trust.

The Chairman said it was impossible to separate the generating expenses.

Mr. Brookman pointed out that the number of units supplied to the Tramways Trust was not mentioned.

The Chairman said he had pointed out that for several years they had been putting away money to provide for the contingency of losing the tramway units. Their whole object in doing this was to maintain the 10 per cent. dividend. All he could add was that the increase of business going on now was equal to that of last year.

The report was then adopted, and Mr. Sellon re-elected a director.

On the motion of Mr. A. F. Farish, a hearty vote of thanks was accorded the staff in Australia, and a vote of thanks to the board was also passed on the motion of Mr. Parker.

Elmore's German and Austro-Hungarian Metal Co., Ltd.

A meeting of the holders of the first debenture stock of the above company was held on Monday at the offices, Finsbury House, Blomfield Street, E.C., to consider a scheme of arrangement for the future, dealing with the stock, both as to interest and repayment.

Mr. John MacFarlan, chairman of the board, who presided, proposed a resolution approving of a scheme which has been circulated among the holders. He said he sincerely hoped that no debenture-holder had been alarmed at the action of the directors in regard to the proposals which were to be submitted to them. The position was entirely due to the bankers in Germany, who were their financial advisers there, who said, and he thought with some reason—that if any interest was to be paid, it should be paid out of profits. That meant that they disapproved of the payment of interest by the company out of capital. He thought it would be well to consider the causes which brought about the present position. In 1910 the failure to come to terms by the members of the German Tube Syndicate resulted in a price war, in which they had no alternative but to participate; that war meant a big reduction in prices, and the result was that the metal company, in 1910, was only able to pay its charges, write off depreciation and repairs and maintenance, but left no profit available for dividends on its shares, which dividends were necessary to pay their full interest here. Unfortunately that price war still continued, but they had endeavoured to make up the loss in other directions, and with some success, but trouble again overtook them in the shape of drought, and from May 15th to November 15th they had practically no motive power from their turbines. It was difficult for him to explain the full extent of the loss which the want of water caused them, for the speciality which they produced, and which gave them so high a price, was produced mainly by water-power, and consequently the production of specialities was very small indeed, while they had a large amount of that class of work on their books awaiting execution. The difference between the cost of copper, and the price for which they had sold their goods, so far, had increased, while the weight of sales actually showed an increase over the amount sold in 1910 by nearly 3 per cent. These figures were, he was sure, conclusive evidence that had it not been for abnormal conditions, the result of their trading year so far would have been above the average. He hoped, therefore, it was perfectly clear to everyone that the alterations they suggested were not brought forward in any way as a policy of despair, but on the contrary, they as directors, with their friends, were the holders of over £36,000 of debenture stock, and they had no hesitation in proposing the alterations, and accepting them for themselves and friends. He felt sure that the debenture-holders realised that sooner of later a reduction in interest would be proposed, the question being whether it could be done by general consent on some such scheme as was now proposed, and they felt that now capital expenditure on a large scale had ceased, and that they had a model factory capable of producing 40 tons of finished goods per week, and actually averaging for nine months over 36 tons per week, replete with modern appliances, and which was recognised as being the very last word in copper tube making, it was desirable to put the Metall Co., which was their only asset, on the best possible basis, both as a dividend-earning and also a marketable concern. The Metall Co. had been founded 20 years, and as stated in the circular, the profits for the last seven years had averaged £11,653 per annum, and that was after deducting £29,582 during the seven years by way of depreciation and repairs and maintenance, in addition to German income-tax. The Metall Co. must, therefore, be recognised by them as it was recognised in Germany, as a sound profit-earning undertaking, and the proposal to convert the mortgage upon the Schladern property into an equivalent amount of share capital, improved its capital position very considerably, as instead of holding charges which could not be realised without a stoppage of the company, their trustees would hold shares to the value of M.2,000,000 in a company, which for the last seven years had earned profits averaging nearly £12,000 per year, and such shares would, if required, be saleable, and so

greatly facilitate the sale of the Metall Co., which they anticipated would be the result when the present price war had ceased and normal conditions again prevailed. From the accounts of the Metall Co. they would have seen that during the five years ending December 31st, 1910, it spent £37,000 on additions and improvements (of which £13,000 was out of profit earned) so that the company had been able to save £13,000 during the last five years, in addition to paying its heavy charges for interest. In order that the debenture-holders should have their rights properly safe-guarded, the directors had gone to the Court with regard to the proposals, and after they had passed the resolutions, they would be submitted to the Court for confirmation. The resolutions were more or less formal, but No. 2 was to sanction the reduction in the rate of interest from 8 per cent. to 6 per cent., and No. 3 was to sanction the proposal that interest could only be paid when it was earned by way of profits. The directors believed that the latter resolution was desirable in the interests of sound finance, and it was only proposed to obviate the necessity, should occasion arise, of paying interest out of capital. The Mertens' process had not made so much progress as they had hoped. The company owning the patents was contemplating the creation of a large International company, and the sale of licences to use the process was more or less in abeyance in consequence, but they were, nevertheless, making small deliveries regularly. He understood that an amendment would be moved to the scheme with the view of providing :—(1) That no moneys shall be set aside for the purpose of writing off any amount standing to the debit of profit and loss until after the interest has been paid ; (2) that while interest is reduced to 6 per cent., that in the event of profit over and above such interest being earned, the difference between 6 per cent. and 8 per cent. shall be paid to the debenture-holders before any dividends are paid upon the shares of the company ; (3) that in the event of the sale of the Metall Co., should the purchase price be more than sufficient to pay off the debenture stock at par, that such additional amount shall, in the first place, be applied to the payment of any arrears of interest at the rate of 8 per cent. per annum ; and (4) that the interest shall be cumulative. The directors had carefully considered those amendments, and as they were not contrary to the principle which the directors desired should be adopted, they were prepared to accept them. Before moving the resolutions, he would once more emphasise the fact that they would virtually be the owners of a business well established, well equipped, and which had earned good profits, and which should earn even better profits in the future.

Mr. Heal formally seconded the resolution.

Mr. Nettlefold moved the amendment as outlined by the Chairman, which was seconded by Mr. E. D. Hartland, and carried as the substantive motion *nem. con.*

Stock Exchange Notices.—The Committee has appointed special settling days as under :—

Thursday, December 14th.—Anglo-Argentine Tramways Co., Ltd., scrip fully and partly paid for a further issue of £1,500,000 5 per cent. debenture stock.

And ordered the undermentioned securities to be quoted in the Official List :—

Anglo-Argentine Tramways Co., Ltd.—Scrip, partly paid, for a further issue of £1,500,000 5 per cent. debenture stock.

County of London Electric Supply Co., Ltd.—Further issue of £50,000 4½ per cent. second debenture stock.

Applications have been made to the Committee to appoint a special settling day in :—

Manaos Tramways and Light Co., Ltd.—300,000 ordinary shares of £1 each, fully paid (Nos. 1 to 300,000).

And to allow the following securities to be quoted in the Official List :—

Marconi's Wireless Telegraph Co., Ltd.—Further issue of 38,325 ordinary shares of £1 each, fully paid (Nos. 466,676 to 500,000).

Isle of Thanet Electric Tramways and Lighting Co., Ltd.—The directors' statement, as summarised in the *Times*, shows that for the year ended September 30th there was a profit of £21,785, compared with £18,242 for the previous year. The directors recommend a dividend of 2½ per cent. on the preference shares, and propose to place £1,500 to reserve, to appropriate £6,000 towards future maintenance of permanent way, to create a third party insurance reserve of £2,000, and to carry forward £2,282. The traffic receipts showed an increase of £2,817. The sale of electricity compared with the previous year increased by £1,784, or over 32 per cent. The auditors' certificate states that no depreciation has been written off, but an additional sum of £5,000 has been added to reserve accounts from the revenue balance of September 30th, 1910.

Norwegian Electrochemistry. — The transaction between Norwegian and German companies, to which reference was made a few weeks ago, has now been approved at a general meeting of the Norwegian Hydro-Electric Nitrogen Co., of Christiania, which has agreed to take over the financial interests held by the German chemical works as represented by the Baden Aniline and Soda Co. in the Norwegian nitrogen industry. It has also been decided to increase the share capital of the Norwegian company by £714,000 to £2,340,000, whilst a debenture loan of £1,370,000 has been subscribed by the Banque de Paris et des Pays Bas and the Société Générale.

Globe Telegraph and Trust Co., Ltd.—An interim dividend of 2s. per share is announced.

French Electrical Companies.

The Société Industrielle des Téléphones, which has a share capital of £720,000, realised gross profits of £101,000 in 1910-11 as compared with £106,000 in the preceding year. The net profits were £59,900, as against £65,000 in 1909-10, and the dividend remains unchanged at 12s. per £12 share. The distribution absorbs £36,000 and £22,000 has been allocated to depreciation, as contrasted with £28,000 in 1909-10. According to the directors' report, the manufacture of the Loango-Libreville cable, which represents £80,000, only came partly into consideration in the financial results for 1910-11.

The Compagnie Générale d'Electricité, of Paris, earned profits on manufacturing of £142,000 in 1910-11, as compared with £139,000 in the preceding year, and extraordinary profits of £220,000, as against £83,000 in 1909-10. After meeting interest charges on debentures, there remain net profits of £320,000. A dividend has been declared at the rate of £1 12s. per share, this contrasting with £1 8s. in the previous year. The extraordinary profits were obtained from the disposal of central stations in Rouen and Nantes to non-associated companies, and the sale of the Nancy station to a subsidiary company, which promises to be of great importance through the extension of supply to the industrial district of Meurtha and Moselle.

The Compagnie Parisienne de l'Air Comprimé, of Paris, reports an increase in the proceeds both from the supply of electricity and compressed air in 1910-11. After making provision to the extent of £120,000 for depreciation as against £88,000 in 1909-10, the accounts indicate net profits of £101,000, as contrasted with £102,000 in the previous year. It has been decided to pay a dividend of £1 12s. per share, being the same rate as in 1909-10. As the electric supply business will pass into the hands of the Compagnie de Distribution Electrique at the end of 1914, the Compagnie de l'Air Comprimé is now devoting special attention to the development of the compressed air department, the concession for which extends to 1927.

Prospectus.—*Puebla Tramway, Light and Power Co.*—This company has this week been offering for subscription £616,438 prior lien 5 per cent. 50-year gold bonds to bearer, at 95 per cent. The prospectus contained, among other particulars, the following statements :—

"The company's business has outgrown the capacity of the plants installed at Portezuelo, and the concession from the City of Puebla requires a minimum continuous supply of 16,500 H.P. to be available for sale within the city limits not later than August, 1913. The directors have accordingly decided to lay down a large hydro-electric plant at Tuxpango with transmission lines to the cities of Puebla and Vera Cruz. Hitherto it has been the custom of the various manufacturers in the State of Puebla to generate power for their own consumption from small falls of water adjacent to the factories, the cost of steam coal being prohibitive. The tendency of factories is gradually to remove into or near to the city of Puebla in order to secure power from the company, and this movement is likely to increase. In Vera Cruz it is intended to supply electricity in bulk to Vera Cruz Electric Light, Power and Traction, Ltd., with whom a contract is being arranged.

"The existing installations have a continuous power of 7,500 H.P. at the switchboard, and with the masonry reservoir they have a peak load capacity of over 11,000 H.P. The directors are advised that the Tuxpango and Atoyac Falls, when fully developed, will give a continuous power of 45,000 H.P. at the turbines, and will have a peak load capacity of some 70,000 H.P.

"The full development of the Tuxpango and Atoyac Falls can be carried out most economically. At present it is only proposed to undertake sufficient work to provide 17,000 H.P. at the turbines, but the works will be so planned as to enable the complete installation to be effected when necessary without increasing the capital cost per H.P.

"The existing main distribution lines (all new) have a total length of over 112 miles, exclusive of the local distribution systems, and supply the following towns, viz: Puebla, Cholula, Atlixo, Santo Domingo, Apizaco, Santa Ana, Tlaxcala, Santa Cruz, Panzacola and San Rafael.

"The new transmission lines, 147 miles in length, will connect the new power plant at Tuxpango with Puebla (78¼ miles distant) on the one hand and with Vera Cruz (68¼ miles distant) on the other hand.

"Work has already been commenced on the new transmission line and plant, upon which it is proposed to expend approximately £300,000, and should be completed in about two years.

"The $3,000,000 prior lien 5 per cent. gold bonds have been sold by the company to provide the price payable for the shares and debentures of the San Agustin Co. and funds for the construction and equipment of the new works, for the repayment of moneys borrowed and used for capital purposes, and for further working capital."

The list was to close yesterday for town and to-day for country applications.

Echo Answers "Where ?"—A correspondent of the *Financial Times* writes, asking what has become of the assets of the London Electrobus Co., which was handed over to the Reorganisation and Control Syndicate. Being a shareholder, he naturally wants to know whether the company is absolutely defunct. Our contemporary suggests that perhaps the liquidator will answer him.

MARKET QUOTATIONS.

Wednesday, December 6th.

CHEMICALS, &c.		Latest Price.	Fortnight's Inc. or Dec.
a Acid, Hydrochloric	per cwt.	5/-	..
a " Nitric	"	22/-	..
a " Oxalic	"	28/-	..
a " Sulphuric	"	5/6	..
a Ammoniac Sal	"	42/-	..
a Ammonia, Muriate (crystal)	per ton	£29	..
a " "	"	£30	..
a Bleaching powder	"	£5 10	..
a Bisulphide of Carbon	"	£18	..
a Borax	"	£16	..
a Ferro-Silicon (50 %)	"	£11 10	..
a Copper Sulphate	"	£20	..
a Lead, Nitrate	"	£25 10	..
a " White Sugar	"	£22 15	..
a " Peroxide	"	£32	..
a Methylated Spirit	per gal.	2/6	..
a Potassium, Bichromate, in casks	per lb.	3½d.	..
a Potash, Caustic (75/80 %)	per ton	£20	..
a " Chlorate	per lb.	3½d.	..
a " Perchlorate	"	4½d.	..
a Potassium, Cyanide	"	7d.	..
a Shellac	per cwt.	68/-	..
a Sulphate of Magnesia	per ton	£4 10	..
a Sulphur, Sublimed Flowers	"	£6 10	..
a " Recovered	"	£5 10	..
a " Lump	"	£5 5	..
a Soda, Caustic (white 70 %)	"	£11	..
a " Chlorate	per lb.	3½d.	..
a " Crystals	per ton	£3 5	..
a Sodium Bichromate, casks	per lb.	3d.	..
a " Cyanide (basis 100 %)	"	7d.	..
METALS, &c.			
b Aluminium Ingots, in ton lots	per ton	£60	£10 dec.
b " Wire, in ton lots	"	£102	..
b " Sheet, in ton lots	"	£120	..
p Babbitt's metal ingots	"	£38 to £145	..
c Brass (rolled metal 2" to 12" basis)	per lb.	7⅜d.	..
c " Tube (brazed)	"	9⅝d.	½d. inc.
c " " (solid drawn)	"	7⅜d.	½d. inc.
c " Wire, basis	"	7½d.	..
c Copper Tubes (brazed)	"	10½d.	½d. inc.
c " " (solid drawn)	"	9⅝d.	½d. inc.
g " Bars (best selected)	per ton	£75	£1 inc.
g " Sheet	"	£75	£2 inc.
g " Rod	"	£75	£2 inc.
e " (Electrolytic) Bars	"	£61 10	£1 inc.
e " " Sheets	"	£77 10	£1 10 inc.
e " " Rods	"	£65	£1 inc.
e " " H.C. Wire	per lb.	8½d.	½d. inc.
f Ebonite Rod	"	5/9	..
f " Sheet	"	4/9	..
n German Silver Wire	"	1/11	..
h Gutta-percha, fine	"	5/- to 7/-	..
h India-rubber, Para fine	"	4/5½	2½d. inc.
i Iron Pig (Cleveland warrants)	per ton	47/10½	..
l " Wire, galv. No. 8, P.O. qual.	"	£14	..
g Lead, English Pig	"	£16 to £16 5	5/- dec.
m Manganin Wire No. 28	per lb.	6/6	..
g Mercury	per bot.	£8 2 6	7/6 dec.
d Mica (in original cases) small	per lb.	6d. to 2s.	..
d " " " medium	"	2/6 to 4/-	..
d " " " large	"	4/6 to 8/6	..
p Phosphor Bronze, plain castings	"	11d.	..
p " " rolled bars & rods	"	1/0½	..
p " " rolled strip & sheet	"	1/1	..
o Platinum	per oz.	185/-	..
e Silicium Bronze Wire	per lb.	8½d.	..
r Steel Magnet, in bars	per ton	£55	..
g Tin, Block (English)	"	£203 to £203	£7 inc.
n " Wire, Nos. 1 to 16	per lb.	2/3	..
p White Anti-friction Metals	per ton	£45 to £150	..
k Zinc, Sh'ts (Vieille Montagne bnd.)	"	£31 2 6	10/- inc.

Quotations supplied by—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d F. Wiggins & Sons.
e Frederick Smith & Co.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakspeare.
h Edward Till & Co.
i Bolling & Lowe.
k Morris Ashby, Ltd.
l Richard Johnson & Nephew, Ltd.
m W. T. Glover & Co., Ltd.
n P. Ormiston & Sons
o Johnson, Matthey & Co., Ltd.
p
r W. F. Dennis & Co.

France.—The balance sheet of La Compagnie Electrique de la Loire for the last financial year shows a profit of £25,600, as compared with £22,250 in the preceding 12 months.

La Compagnie Limousine d'Electricité is the name of a new company which has lately been formed at Limoges (Haute Venne), with a capital of £40,000.

STOCKS AND SHARES.

Tuesday Evening.

DECEMBER in the Stock Exchange is gradually achieving the reputation or the notoriety amongst the months which attaches to Saturday amongst the days of the week. The holiday feeling makes itself manifest quite early in the month, and the inclination to enter into fresh commitments is blunted. Moreover, there is generally a little host of new issues made in December, just as Saturday is a favourite day for the emission of a new prospectus. Business at the present time is quiet and continues to be somewhat patchy. There is, however, plenty doing in the section devoted to the traction, power and light issues of the Western Hemisphere.

English Electricity Supply shares are steady, with a tendency to harden, which is more particularly noticeable in the cases of City Ordinary and Notting Hill Preference, these securing rises on the week. South London Debenture improved a little, but South Metropolitan Preference at 1 middle are ⅛ lower.

The next developments on the part of the London County Council are being eagerly awaited by those interested in the market for all the Metropolitan Electricity shares. At the moment, the tide seems to be running all in favour of the companies. The bold prophet may even see in the present negotiations a future linking-up between the London County Council and the companies which probably never entered the ken of the original promoters of the latter. Still, these are early days to talk about such a rapprochement; but holders of Electricity Supply shares can possess themselves in patience, with confidence that, unless events take an unexpectedly bad turn, their interests are likely to be fortified considerably during the next 6 or 12 months.

The Railway market is in less happy case. Prices go up one day, to recede the next; and although a semblance of strength is retained on balance, the uncertainty felt with regard to the labour outlook renders Home Railway stocks anathema to many British investors at the present time. In spite of the extension of the Electricity system amongst leading lines, the mere stock market is dull. Metropolitan Ordinary and Surplus Lands are a little better, and Districts put on ⅜, reflecting the latest rise in Omnibus stock on the fine report. But the Steam stocks fail to make much headway, notwithstanding the fact that recognition of the Unions is, for all practical purposes, already granted by the companies. East London Ordinary rose to 6¼, and the Debenture stocks are also rather better. Underground Electric Income bonds provided the feature of the week with a substantial rise to 68, this being a gain of 4 points. The advance is based on expectations of a dividend considerably better than that of last time, and the buying of the bonds has been fairly persistent, encouraged also by the dividend on the London General Omnibus stock, supplemented by the excellent report already mentioned.

New issues command a good following, and prices on the whole are distinctly firm. The new Mexican Light and Power Second Debenture firmed up to ¼ discount. South American Light and Power Debenture hardened to 2⅜ premium after being down to 2 premium. The result of the issue of Constantinople Telephones was about what might have been expected in view of the unpropitious time at which the prospectus was launched, and underwriters are understood to have been left with a good proportion of their obligations. The price of the shares is ¼ discount to par. Better success attended the issue of Preference shares by the Automatic Telephone Company. The guarantee of the British Insulated of course attracted buyers, and the subscription, we are informed unofficially, was decidedly satisfactory. The price is quoted par to ⅛ premium, and in view of the fact that the parent company's £5 Preference shares stand at 6, this result is only natural. The Automatic Telephone Ordinary shares were left, we understand, to the tune of about 50 per cent. in the hands of the underwriters, and in these there is practically no market at present.

Amongst the Manufacturing shares, Edison & Swan are ⅛ better, and the 4 per cent. Debenture stock rose 1 upon a little demand last week. India-Rubber shares lost ¼, and British Insulated Ordinary fell ⅛ on the new issue of the Automatic Telephone Company, proprietors of the former apparently realising some of their shares in order to take up the latter. Castner-Kellners at 3⅜ are 3s. 9d. down, of which 2s. 6d. is represented by the dividend deduction. India-Rubber Preference are lower, but the Ordinary remain at 13½. Babcock & Wilcox have gone back a trifle, sellers being tempted by the recent rapid rise.

The Telegraph market still relies for most of its business upon the dealings in Marconi shares, which are very wild and active. The ordinary rising to 55s. caused the new shares to spurt to 13s. 6d. premium. Anglo-American Telegraph 6 per cent. Preferred rose ¼, the merits of the stock as a speculative investment becoming more generally recognised. Even now the yield is still a high one, having regard to the nature of the security. American Telephone and Telegraph went back 1. The selling proceeded from London, while New York has been reluctant to take the stock. Amasen Telegraphs at 7¼ are *ex* the 8s. dividend deducted last Wednesday, so that on balance the price is slightly to the good. National Telephone issues are quieter again. Incidentally, it may be remarked that the market in Consols is a little perturbed at the thought of how the Government intends to finance the National Telephone Company at the end of the year, and this is one reason why the price of the Funds has fallen again after its previous little spurt.

In the Foreign Traction Department business goes on at a merry rate, and there is more doing here than in any other market of similar size throughout the Stock Exchange. Prices, however, are not much altered on the whole. Rio Trams have begun to recover, and Sao Paulo Trams at 188 are a point higher. Anglo-Argentines are very firm, the First Preference securing a gain of ½. Bombay and Brisbane Trams are both better on the week. On the other hand, British Columbia issues have been sold pretty heavily, with the result that the Deferred is 3 points lower and the Preferred is down 4. Quite a small demand for River Plate Ordinary had the effect of putting the price up to the extent of 10 points, but in its present unwieldly condition the stock is not easy to negotiate. Canadian General Electric has eased off, but Shawinigan Capital stock rose 1½. For the various Bond issues there is still a brisk inquiry.

Rubber is again on the rise, and prices in the Share Market have not been slow to respond to this better disposition on the part of Mincing Lane.

SHARE LIST OF ELECTRICAL COMPANIES.

ENGLISH ELECTRICITY SUPPLY AND POWER COMPANIES.

NAME.	Stock or Share.	Dividends for 1910.	Dividends for 1911.	Closing Quotations Dec. 5th.	Rise + or Fall —	Present Yield p.c. £ s. d.
Bournemouth & Poole, Ord.	* 10					
Do. 4½ % Pref.	10	5¼	5†	7⅞ — 8⅜	..	6 5 9
Do. Second 6 % Pref.	10	4½	4½	8⅞ — 9¼	..	4 12 4
Do. 4½ % Deb. Stock	Stock	6	6	10⅜ — 11	..	5 9 1
Brompton & Kensington, Ord.	5	4½	4½	101 —103	..	4 7 5
Do. 7 % Cum. Pref.	5	10	9†	7⅞ — 8⅛	..	5 19 4
Central Electric Supply, 4 % Guar. Deb.	100	7	7	7½ — 8	..	4 7 6
Charing Cross, West End & City	5	4	4	98 —101 xd	..	3 19 3
Do. 4½ % Cum. Pref.	5	5	5†	3⅝ — 4	..	6 5 0
Do. "City Undertaking" 4½ % Cum. Pref.	5	4½	4½	4½ — 4⅝	..	4 12 4
Do. Do. 4 % Deb.	100	4½	4½	8¾ — 9	..	5 5 11
Chelsea, Ord.	5	4	4	94 — 98	..	4 1 8
Do. 4½ % Deb.	Stock	5	4†	3⅞ — 4⅛	..	5 14 8
City of London, Ord.	10	4½	4½	98 —100	..	4 10 0
Do. 6 % Cum. Pref.	10	7	6†	12⅜ — 13½	+ ¼	5 6 8
Do. 5 % Deb.	Stock	6	6	12 — 13	..	4 12 4
County of Durham, 5 % First Mort. Deb.	Stock	5	5	119 —123	..	4 1 4
County of London, Ord.	10	4½	4½	101 —104	..	4 6 7
Do. 6 % Pref.	10	5	4†	8⅝ — 9⅛	..	4 18 8
Do. 4½ % Deb.	Stock	6	6	11 — 11½	..	5 4 4
Do. 4½ % Second Deb.	Stock	4½	4½	108 —110	..	4 1 10
Edmundson's, Ord.	5	Nil	Nil	99 —102	..	4 8 3
Do. 6 % Cum. Pref.	5	Nil	Nil	⅜ — ⅝	..	Nil
Do. 4½ % First Mort. Deb.	100	4½	4½	2 — 2½	..	Nil
Folkestone	5	6	6†	82 — 85	..	5 5 11
Do. 5 % Cum. Pref.	5	5	5	4½ — 5	..	6 0 0
Do. 4½ % First Deb.	100	4½	4½	4⅝ — 5⅛	..	4 17 7
Hove	5	9	8†	6¾ — 7¼	..	4 11 10
Kensington & Knightsbridge, Ord	5	9	8†	6⅝ — 7⅛	..	6 4 2
Do. 4 % Deb.	Stock	4	4	91 — 93	..	4 6 0
Kent Elec. Power, 4½ % Deb.	Stock	4½	4½	80 — 84	..	5 7 2
London Electric, Ord.	3	2	..	1½ — 2	..	3 0 0
Do. 6 % Pref.	5	6	6	4¼ — 4⅝	..	6 8 1
Do. 4 % First Mort. Deb.	Stock	4	4	89 — 92	..	4 7 0
Metropolitan	5	5	4†	3⅜ — 4	..	6 5 0
Do. 4½ % Cum. Pref.	5	4½	4½	4¼ — 4⅜	..	4 14 9
Do. 4½ % First Mort. Deb.	Stock	4½	4½	101 —106	..	4 4 11
Do. 3½ % Mort. Deb.	Stock	3½	3½	84½ — 87½	..	4 0 0
Midland Electric Corporation 4½ % First Mort. Deb.	100	4½	4½	96½ — 98½	..	4 11 5
Newcastle-on-Tyne	5	4	4†	3¾ — 4	..	5 0 0
Do. 5 % Pref., Non-Cum.	5	5	5	4 — 4½	..	5 11 1
North Metropolitan Power Supply, 5 % Mortgages (Red.)	100	5	5	99 —102	..	4 18 0
Notting Hill, 6 % Non-Cum. Pref.	10	..	..	10 — 11	+ ¼	..
Oxford	5	7½	6†	6½ — 6⅝	..	5 9 5
St. James' and Pall Mall, Ord.	5	10	10†	8 — 9	..	5 11 1
Do. 7 % Pref.	5	7	7	6⅞ — 7½	..	4 16 7
Do. 3½ % Deb.	100	3½	3½	86 — 88	..	3 19 7
Smithfield Markets, Ord.	5	Nil	..	1⅜ — 1⅝	..	Nil
South London, Ord.	4	5	..	2⅜ — 3½	..	6 8 1
Do. 5 % First Mort. Deb.	100	5	5	100 –103	+ 1	4 17 1
South Metropolitan, 7 % Pref.	1	7	7	1⅞ — 1 1/16	— 1/16	6 11 9
Do. 4½ % First Deb. Stock	100	4½	4½	95 — 98	..	4 11 10
Urban, Ord.	5	5	..	⅞ — 2	..	..
Do. 5 % Cum. Pref.	5	5	..	2 — 2½	..	..
Do. 4½ % First Mort. Deb.	100	4½	4½	86½ — 88½	..	5 1 8
Westminster, Ord.	5	10	10†	7⅞ — 8⅜	..	5 19 5
Do. 4½ % Cum. Pref.	5	4½	4½	5 — 5½	..	4 5 9

COLONIAL AND FOREIGN ELECTRICITY SUPPLY AND POWER.

Adelaide, 6 % Pref.	5	6	6	5½ — 5⅝	+ ⅛	5 4 4
Calcutta, Ord.	5	8½	7†	6½ — 7	..	6 1 5
Do. 5 % Pref.	5	5	5	5 — 5¼	..	4 15 3
Calgary Power, 1st Mort. Bds.	100	5	5	96½ — 98½	..	5 1 6
Canadian Gen. El. Com.	$100	7	7†	112 —117	—3	5 19 8
Do. 7 % Pref.	$100	7	7	118 —122	..	5 14 9
Cordoba Lt., Power and T., Ord.	1	3	3†	⅛ — 1 xd	..	3 0 0
Do. 5 % Deb.	100	5	..	93 — 96	..	5 4 2
Elec. Lt. and P. of Cochabamba, 6 % Bonds	100	6	6	94 — 96	..	6 5 0
Elec. Supply Victoria, 5 % 1st Mort. Deb.	100	5	5	84½ — 87½	..	5 14 3
Elec. Dev. Ontario, 5 % 1st Mort. Bonds	$500	5	5	90½ — 92½	— ½	5 8 1
Kalgoorlie Elec. P. and L., Ord.	10/-	Nil	..	7/16 — 11/16	..	Nil
Do. 6 % Pref.	1	6	6	13/16 — 15/16	..	7 13 10
Kaministiquia Power, 5 % G. Bs.	$500	5	5	102 —104	..	4 16 2
Madras, Ord.	5	..	..	2⅜ — 3¼	..	..
Melbourne, 5 % 1st Mort. Deb.	100	5	5	98 —100	..	5 0 0
Mexican El. Lt., 5 % 1st M. Bds.	..	5	5	88 — 90	..	5 11 1
Mexican Lt. & Power, Common	$100	4	4†	89 — 91	..	4 7 11
Do. 7 % Cum. Pref.	$100	7	7	108 —110	..	6 7 3
Do. 5 % 1st Mort. Gold Bds.	..	5	5	95½ — 97	..	5 2 7
Monterey Rly. Light & Power, 5 % 1st Mort. Deb.	100	5	5	90½ — 92½	..	5 8 1
Montreal, Lt., H. and Power	$100	7	8	185 —190	..	3 13 8
Northern, Lt., Power and Coal, 5 % 1st Mort. Bonds	$500	5	..	41 — 43	..	11 12 6
River Plate, Ord.	Stock	10	..	233 —243	+10	4 2 4
Do. 6 % Non-Cum. Pref.	Do.	6	6	104 —110 xd	..	5 9 1
Do. 5 % Deb. Stock	Do.	5	5	102 —104	..	4 16 2
Roy. Elec. Co., Montreal, 4½ % 1st Mort. Deb.	100	4½	4½	99 —101	..	4 9 1
Shawinigan Water, Capital	$100	4	5†	123½ —125½	+1½	3 3 9
Do. 5 % Con. 1st Mort. Bonds	$500	5	5	107 —109	..	4 11 9
Do. 4½ % Per. Deb.	Stock	4½	4½	102½ —104½	..	4 6 2
Toronto Power, 4½ % Deb.	Do.	4½	4½	100 —102	..	4 8 8
Vera Cruz Lt., P. and T., 5 % 1st Mort. Deb.	100	5	5	92 — 94	..	5 6 5
Victoria Falls Power, Pref.	1	Nil	11/16d.	3/32 — 7/32	— 1/32	..
West Kootenay Power and Lt., 1st Mort. 6 % Gold	100	6	6	106½ —108½	..	5 10 7

TELEGRAPH AND TELEPHONE COMPANIES.

Amazon Telegraph	10	Nil	4†	7 — 7⅛xd	+ 1/8	..
Do. 5 % Deb. Red.	Stock	5	5	99 —101	..	4 19 0
American Telep. & Teleg., Cap.	$100	8	8†	143 —145	—1	5 10 4
Do. Collat. Trust	$1000	4	4	95 — 97	..	4 2 6
Anglo-American Telegraph	Stock	3½	3†	66 — 68	..	5 8 8
Do. 6 % Pref.	Do.	6	6	110⅜ —111⅞	+ ⅛	5 7 5
Do. Def.	Do.	30/-	..	25⅜ — 26¼	..	5 14 3
Anglo-Portuguese Tel., 5 % Mort. Deb.	100	5	5	101 —103	..	4 17 1
Chili Telephone	5	7	..	7 — 7⅛	+ ⅛	4 16 7
Commercial Cable, Stlg. 4% Deb.	Stock	4	4	86½ — 88½	..	4 10 5
Cuba Telegraph	10	6	6†	10 — 10⅜	..	5 11 7
Do. 10 % Pref.	10	10	10	17 — 18	..	5 11 1
Direct Spanish Telegraph, Ord.	5	4	4†	3⅛ — 3⅜	..	5 6 8
Do. 10 % Cum. Pref.	5	10	10	8¼ — 8⅝	..	5 14 8
Do. 4½ % Debs.	50	4½	4½	100½ —102½	+ ½	4 7 10
Direct United States Cable	10	4½	..	7⅞ — 8⅛	..	5 9 1
Direct W. India Cable, 4½ % Reg. Deb.	100	4½	4½	99½ —101½	..	4 8 8
Eastern Telegraph, Ord. Stock	Stock	7	5†	137 —140	..	5 0 0
Do. 3½ % Pref. Stock	Do.	3½	3½	83¾ — 85½	..	4 1 10
Do. 4 % Mort. Deb.	Do.	4	4	100¾ —102½	..	3 18 1
Eastern Extension	10	7	5†	13⅝ — 13⅞	..	5 2 9
Do. 4 % Deb.	Stock	4	4	100⅜ —102⅛	..	3 18 1
East and S. Africa Tel. 4 % Mt. Db. Mauritius Sub.	25	4	4	99 —101	+ ⅛	3 19 3
Globe Telegraph and Trust	10	5⅞	6	10⅜ — 11⅛	..	5 6 8
Do. 6 % Pref.	10	6	6	12⅜ — 13⅛	..	4 10 9
Great Northern Telegraph	10	18	5†	32½ — 33½	..	5 8 3
Indo-European Telegraph	25	18	5†	56 — 58	..	5 12 1
Mackay Companies Common	$100	5	5†	86 — 89	..	5 12 4
Do. 4 % Cum. Pref.	$100	4	4	74 — 77	..	5 3 11
Marconi's Wireless Telegraph	1	5	..	1⅛ — 1⅜	+ ⅛	..
Do. 7 % Cum. Partic. Pref.	1	16	..	1 1/16 — 2 1/16	+ 1/16	..
Monte Video Telephone, Ord.	1	6	6	15/16 — 1 1/16	..	5 12 11
Do. 5 % Pref.	1	5	5	15/16 — 1 1/16	..	5 6 8
National Telephone, Pref.	Stock	6	6†	103¼ —105⅜	..	5 13 9
Do. Def.	Do.	6	6†	122 —124	..	4 16 9
Do. 6 % Cum. 1st Pref.	10	6	6	9⅜ — 10⅛	..	6 14 3
Do. 6 % Cum. 2nd Pref.	10	6	6	9⅜ — 10⅛	..	5 17 1
Do. 5 % Non-cum. 3rd Pref.	5	5	5	5⅛ — 5⅜	..	4 10 11
Do. 3½ % Deb.	Stock	3½	3½	99 —101	..	3 9 4
Do. 4 % Deb.	Do	4	4	99 —101	..	3 19 3
New York Telep., 4½% Gen. Bnds.	100	4½	4½	100⅜ —101½	..	4 8 8
Oriental Telep. and Elec.	1	8	..	1⅛ — 1⅜	..	4 18 6
Do. 6 % Cum. Pref.	1	6	6	1 3/16 — 1 5/16	..	4 13 8
Do. 4 % Red. Deb.	Stock	4	4	88½ — 90½	..	4 8 5
Pacific and European Tel., 4 % Guar. Debs.	Do.	4	4	100 —102	..	3 18 5
Reuter's	8	5	5†	8⅜ — 9½	..	4 6 6
Submarine Cables Trust	Cert.	6	6	130 —133	..	4 10 3
Telephone Co. of Egypt, 4½ % Deb. Red.	Stock	4½	4½	99 —101	..	4 9 1
United River Plate Telephone	5	8	8	7¼ — 7½	..	5 6 8
Do. 5 % Cum. Pref.	5	5	5	5¼ — 5⅝	..	4 10 11
West Coast of America	2½	2½	2½	1 1/16 — 1 1/8	..	4 15 3
Do. 4 % Debs., 1 to 1,500 guar. by Braz. Sub. Tel.	100	4	4	99 —101	..	3 19 3
West India and Panama Teleg.	10	1½	1½†	2½ — 3⅛ xd	..	4 8 10
Do. 6 % Cum. 1st Pref.	10	6	6	10 — 10½ xd	..	5 14 3
Do. 6 % Cum. 2nd Pref.	10	6	6	9⅜ — 10¼ xd	..	5 17 1
Do. 5 % Debs.	100	5	5	103 —105	..	4 15 3
Western Telegraph, Ltd.	10	7	6†	13½ — 14	— ¼	5 0 0
Do. 4 % Deb.	Stock	4	4	101 —103	..	3 17 8
Western Union Tel., 4% Bnds. A	$1000	4	4	106 —109	..	3 13 5
Do. 4½ % Fdg. Bonds	$1000	4½	4½	99½ —102½	..	4 7 10

* Unless otherwise stated, all shares are fully paid. † Interim dividend.

Continued on next page.

SHARE LIST OF ELECTRICAL COMPANIES.—(*Continued.*)

ELECTRIC RAILWAYS AND TRAMWAYS.—HOME.

NAME.	Stock or Share.	Dividends for 1910.	Dividends for 1911.	Closing Quotations Dec. 5th.	Rise + or Fall —	Present Yield p.c. £ s. d.
Bath Trams, Pref. Ord.	1	Nil	Nil	¼ — ⅜	..	Nil
Do. 5 % Pref.	1	5	5	⅝ — ¾	..	6 13 4
Do. 4½ % Deb.	100	4½	4½	80 — 85	..	5 5 11
Brit. Elec. Trac., Ord.	10	Nil	Nil	⅞ — 1⅛	..	Nil
Do. 6 % Pref.	10	1½	1½	3⅞ — 4⅛	..	3 8 7
Do. 5 % Deb.	100	5	5	93 — 96	..	5 4 2
Do. 4½ % 2nd Deb.	100	4½	4½	78 — 82	..	5 9 9
Central London Railway, Ord.	100	8	8†	67 — 69	..	4 5 9
Do. Pref.	100	4	4	84 — 86	..	4 13 0
Do. Def.	100	2	..	50 — 52	..	3 18 5
Do. 4 % Deb.	100	4	4	102 —104	..	3 16 11
City & South London, Ord.	100	1½	1½†	30 — 31	— ½	4 16 9
Do. 5 % Pref., 1891	100	5	5	108 —110	..	4 11 0
Do. Do. 1896	100	5	5	104 —106	..	4 14 4
Do. Do. 1901	100	5	5	[illegible]	..	4 15 3
Do. Do. 1908	100	5	5	102 —104	..	4 16 2
Do. 4 % Deb.	100	4	4	100 —102	..	3 18 5
Dublin United Trams, 6 % Pref.	10	6	6	11 — 12	..	5 0 0
Great Northern & City, Pr'f. Ord	10	Nil	..	1 — 1½	..	Nil
Hastings Trams, 6 % Pref.	5	Nil	3†	⅜ — ½	..	Nil
Do. 4½ % Deb.	100	4½	4½	73 — 78	..	5 14 8
Isle of Thanet Trams, 5 % Pref.	5	2½	..	2¾ — 3	..	4 3 4
Do. 4 % Deb.	100	4	4	77 — 82	..	4 17 7
Lancashire United, 5 % Deb.	100	5	5	79 — 82	..	6 1 11
London Elec. Railw'ys, 4 % Deb.	100	4	4	96 — 98	..	4 1 8
London United Trams, 5 % Pref.	10	Nil	..	2⅞ — 3⅛	..	Nil
Do. 4 % Deb.	100	4	4	71 — 75	..	5 6 8
Metropolitan Railway Consol.	100	1⅝	2†	43 — 43½	+ ½	3 3 8
Do. Surplus Lands	100	2⅝	3†	66 — 68	+1	4 0 11
Do. 3½ % Deb.	100	3½	3½	89 — 91	..	3 17 0
Do. 3½ % Pref.	100	3½	3½	85 — 87	..	4 0 6
Do. 3½ % Con. Pref.	100	3½	3½	84 — 86	..	4 1 5
Metropolitan District Ord.	100	Nil	..	30⅞ — 31	+ ⅜	Nil
Do. 6 % Deb.	100	6	6	144 —146	..	4 2 2
Do. 4 % Deb.	100	4	4	97 — 99	..	4 0 10
Do. 4 % Prior Lien	100	4	4	100 —102	..	3 18 5
Do. 4½ % First Pref.	100	3½	4½†	88 — 90	..	3 12 3
Do. 3½ % Gtd.	100	3½	3½	74 — 76	..	4 12 1
Metropolitan Elec. Trams, Ord.	1	6½	5†	3¼ — 3⅜	..	5 12 4
Do. Def.	1	Nil	..	3⅜ — 3⅞	..	Nil
Do. 5 % Pref.	1	5	5	3⅞ — 3⅞	..	5 3 1
Do. 4½ % Deb.	100	4½	4½	100½—102½	..	4 7 10
Do. 5 % Deb.	100	5	5	101 —103	+ ½	4 17 1
Potteries, Ord.	1	3	..	⅞ — 1	..	..
Do. 5 % Pref.	1	5	5	⅞ — 1	..	6 13 4
Do. 4½ % Deb.	100	4½	4½	87½— 90½	..	4 17 2
South Metro. Trams, 6 % Pref.	1	6	..	⅝ — ¾	..	6 17 2
Do. 4 % Deb.	100	4	4	72 — 77	..	5 3 11
Underground Elec. Railways	10	..	..	1⅞ — 2⅛	..	..
Do. 4½ % Bonds	100	4½	4½	100 —102	..	4 8 3
Do. 6 % Income	100	1	1½†	67 — 69	+4	1 9 0
Do. Power House Debs.	100	4	4	100 —102	..	3 18 5
Yorkshire (West Riding), Ord.	5	Nil	..	⅛ — ¼	..	Nil
Do. 6 % Pref.	5	Nil	..	2⅛ — 2⅜	..	Nil
Do. 4½ % Deb.	100	4½	4½	80 — 85	..	5 5 11

ELECTRICAL RAILWAYS AND TRAMWAYS.—COLONIAL AND FOREIGN.

Anglo-Arg. Trams, 1st Pref.	5	5	5½†	5⅛ — 5⅝	+ ⅛	4 14 1
Do. 2nd Pref.	5	5	5½†	4⅛ — 5⅛	+ ⅛	4 18 9
Do. 4 % Deb.	100	4	4	95 — 97	+1	4 2 6
Do. 4½ % Deb.	100	4½	4½	101½—103½	..	4 7 0
Do. 5 % Deb.	100	5	5	98½—100½ xd	..	4 19 6
Auckland Trams, 5 % Deb.	100	5	5	104 —107	..	4 13 6
Bombay Elec. S. & Trams, Pref.	10	6	6	10⅝— 11⅜	+ ⅛	5 5 6
Do. 4½ % Deb.	100	4½	4½	97 — 99	..	4 10 11
Do. 5 % 2nd Deb.	100	5	5	98½—100½	..	4 19 6
Brisbane Trams Invt., Ord.	5	8	8†	8 — 8¼	+ ¼	4 17 0
Do. 5 % Pref.	5	5	5	4⅝ — 5⅛	..	4 15 3
Do. 4½ % Deb.	160	4½	4½	103 —106	..	4 5 9
B. Columbia Elec. Rly., Def.	100	8	..	140 —144	—3	5 11 1
Do. Pref. Ord.	100	6	6	120 —124	—4	4 16 9
Do. 5 % Pref.	100	5	5	109 —112	— ½	4 9 3
Do. 4½ % 1st Mort. Deb.	40	4½	4½	99 —102	..	4 8 8
Do. 4½ % Vancouver Deb.	100	4½	4½	104 —106	..	4 4 11
Do. 4½ % Con. Deb.	100	4½	4½	102 —104	..	4 6 7
Calcutta Trams, Ord.	5	6	..	5⅜ — 6⅛	..	4 18 2
Do. 5 % Pref.	5	5	5	5 — 5¼	..	4 15 3
Do. 4½ % Deb.	100	4½	4½	102 —105	..	4 5 9
Cape Electric Trams	1	Nil	2½†	⅞ — 1	..	4 0 0
City Buenos Aires Trams (1904)	5	5	5	5⅜ — 5⅝	..	4 5 1
Do. 4 % Deb.	100	5	5	97 —100	..	5 0 0
Colombo Elec. Tr. & Lt., 5 % Deb.	100	5	5	93 — 98	..	5 2 0
Havana Elec. Rly., 5 % Bonds	$1000	5	5	102 —105	+ ½	4 15 3
Kalgoorlie Elec. Trams	1	Nil	..	⅞ — 1	..	Nil
Do. 5 % A Deb.	100	5	5	92½— 95½	..	5 4 9
Do. 6 % B Deb.	100	5	6†	62 — 66	..	7 11 6
La Plata Elec. Trms, Prf.	1	6	6	⅞ — 1	..	6 0 0
Lisbon Elec. Trams, Ord.	1	5½	6†	1 — 1¼	..	4 8 0
Do. 6 % Pref.	1	6	6	1 — 1¼	..	4 16 0
Do. 5 % Deb.	100	5	5	96 —100	..	5 0 0
Madras Elec. Tr. (1904), Deb.	100	5	5	96 — 99	..	5 1 0
Manaos Trams & Lt., 1st Deb.	100	5	5	92 — 94	..	5 6 5
Manila Elec. R. and Ltg., Bonds	$1000	5	5	99½—101	+ ½	4 19 0
Mexico Trams Com.	$100	7	7†	123 —125	..	5 12 0
Do. Gen. Con. 5 % Bonds	..	5	5	98 —100	..	5 0 0
Do. 6 % Bonds	100	6	6	102 —104	..	5 15 3
Para Elec. Rlys. & Lt., Ord.	5	10	10†	6¾ — 7¼	..	6 18 0
Do. 6 % Pref.	5	6	6	5¾ — 5⅞	..	5 4 4
Do. 5 % 1st Deb.	100	5	5	97½— 99½ xd	..	5 0 6
Perth (W.A.) Elec. Tr., Ord.	1	2½	..	⅞ — 1⅛	..	2 7 1
Do. 5 % 1st. Deb.	100	5	5	101½—103½	..	4 16 7
Rangoon El. Tr. & Sup., Pref.	5	6	6	5¼ — 5⅜	..	5 9 1
Do. 4½ % 1st Deb.	100	4½	4½	98 —101	..	4 9 1
Rio de Janeiro Trams	$100	4½	5†	115¼—116½	+ ¼	4 6 0
Do. 1st Mort. 5 % Bonds	..	5	5	102 —103	..	4 17 1
Do. 5 % Mort. Bonds	100	5	5	95⅞— 96⅞	..	5 3 4
Sao Paulo Tram, Lt. and P.	$100	10	10†	186 —190	+1	5 5 3
Do. 5 % 1st Deb.	$500	5	5	102 —104 xd	..	4 16 2
Singapore Trams, 5 % Deb.	100	5	5	82 — 85	..	5 17 8
Southern El. Tr. B.A., 5 % Deb.	100	5	5	96½— 97½	..	5 2 7
Un. Elec. Trams Monte Video	5	6	7	5⅝ — 6	..	5 0 0
Do. 6 % Pref.	5	6	6	5⅛ — 5⅜	..	5 11 7
Do. 5 % 1st Deb.	100	5	5	99 —102	..	4 18 0
Winnipeg Elec. Rly., 4½ % Deb.	100	4½	4½	104 —106	..	4 4 11

MANUFACTURING COMPANIES.

Aron, Ord.	1	Nil	6	⅜ — ½	..	5 14 3
Do. 6 % Pref.	1	9	6	⅝ — ¾	..	5 12 11
Babcock & Wilcox	1	26	24†	5¾ — 6¼	— ¼	4 11 10
Do. Pref.	1	6	6	1⅛ — 1⅜	..	Nil
B.I. & Helsby Cables	5	10	8†	6⅜ — 7⅛	— ¼	7 0 4
Do. Pref.	5	6	6	5½ — 6½	..	4 16 0
Do. Deb.	100	4½	4½	102 —104	..	4 6 7
British Thomson-Houston, Deb.	100	4½	4½	94 — 97	..	4 12 9
British Westinghouse, Pref.	3	Nil	..	¼ — ⅜	..	Nil
Do. Deb.	100	4	4	57 — 60	..	6 13 4
Do. 6 % Prior Lien	100	6	6	100 —102	..	5 17 8
Browett, Lindley, Ord.	1	Nil	..	1/6—2/-	..	Nil
Do. Pref.	1	Nil	..	5/- —6/-	..	Nil
Brush, Ord.	2	Nil	..	0 — ¼	..	Nil
Do. 7 % Pref.	2	Nil	..	0 — ¼	..	Nil
Do. 4½ % Deb.	100	4½	4½	56 — 61	..	7 7 7
Do. 4½ % Second Deb.	100	4½	4½	39 — 44	..	10 4 6
Callender's Cable	5	15	10†	9 — 9⅜	..	7 13 10
Do. Pref.	5	5	5	5 — 5¼	..	4 15 3
Do. Deb.	100	4½	4½	101 —103	..	4 7 5
Castner-Kellner	1	17½	20	34⅛ — 35⅜ xd	— ⅛	5 10 4
Do. Deb.	100	4½	4½	104 —106	..	4 3 4
Crompton & Co.	3	Nil	Nil	⅛ — ⅜	..	Nil
Do. Deb.	100	5	5	60 — 70	..	7 2 10
Dick, Kerr	1	5	..	⅜ — ⅞	..	5 14 3
Do. Pref.	1	6	6	1⅛ — 1⅜	..	5 12 11
Do. Deb.	100	4½	4½	95 — 98	..	4 11 10
Edison & Swan, A, £3 paid	5	Nil	..	⅛ — ⅜	+ ⅛	Nil
Do. fully paid	5	Nil	..	1⅞ — 2⅜	..	Nil
Do. 4 % Deb.	100	4	4	70 — 74	+1	5 8 1
Do. 5 % Second Deb.	100	5	5	77 — 80	..	6 5 0
Electric Construction	2	Nil	2½†	⅜ — ⅝	..	6 13 4
Do. Pref.	2	7	7	1⅜ — 1⅝	— ⅛	8 0 0
Greenwood & Batley, Pref.	10	7	7	7½ — 8½	..	8 5 8
Do. Deb.	100	5	5	94 — 96	..	5 4 2
General Electric, Pref.	10	5	5	8⅞ — 9⅜	— ⅛	5 6 8
Do. Deb.	100	4	4	85 — 90	..	4 8 11
Henley's, Ord.	5	15	10†	11⅞ — 12⅜	..	5 18 10
Do. Pref.	5	4½	4½	4⅛ — 5⅛	..	4 5 11
Do. Deb.	100	4½	4½	104 —106 xd	..	4 4 11
India-Rubber, G. & T.	10	10	..	12½ — 14½	..	6 17 11
Do. Pref.	10	5	5	9⅝ — 10⅜	— ¼	4 17 10
Telegraph Construction	12	20	10†	35 — 37	..	6 7 5
Do. Deb.	100	4	4	100 —102	..	3 18 5
Willans & Robinson	1	Nil	..	⅛ — ⅜	..	Nil
Do. Pref.	5	Nil	..	⅛ — ⅜	..	Nil
Do. Deb.	100	4	4	£2 — £3 xd	..	7 2 10

* Unless otherwise stated, all shares are fully paid. † Interim dividend.

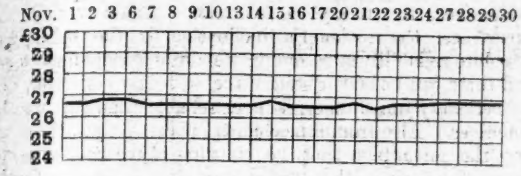
The yields are calculated upon the dividends paid for 1910.

Bank rate of Discount 4 per cent., September 21st, 1911.

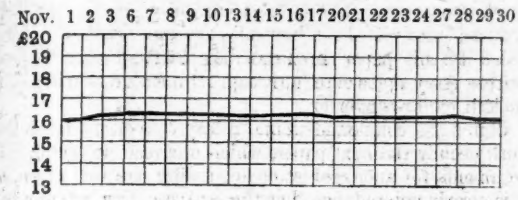
METAL MARKET.

Fluctuations in November.

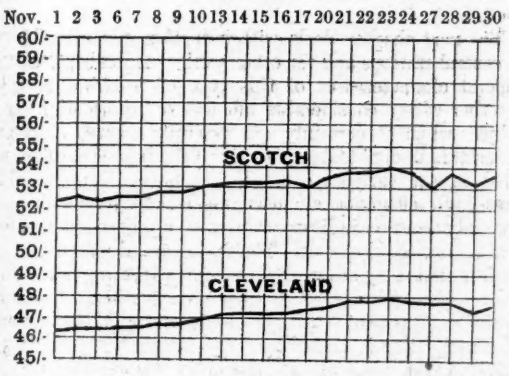
SPELTER (G.O.B's.).



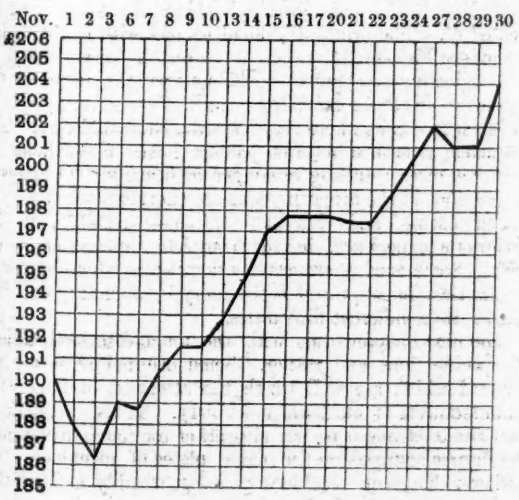
LEAD (ENGLISH).



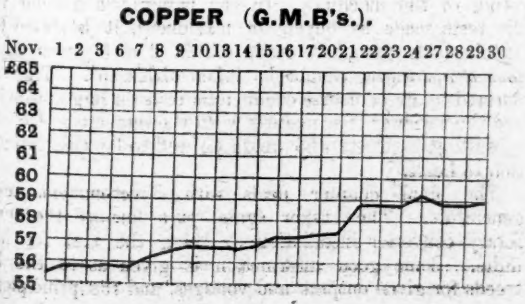
IRON.



TIN.



COPPER (G.M.B's.).



REVIEWS.

Electricity in Locomotion. By A. G. Whyte. London: Cambridge University Press. Price 1s. net.

This book may be unreservedly recommended to those desiring a popular treatment of the developments and possibilities of electricity as applied to tramways, railways, automobiles, ship propulsion, telpherage, and so on. The author commences with a pæan of praise to the unknown inventor of the wheel and axle, and details the gradual evolution of steel rails and wheels. The development of various types of locomotives is next considered, and appropriate treatment is given to dynamo-electric machinery and the means whereby large quantities of energy are electrically distributed. In tramway locomotion electrical energy offers enormous advantages over animal traction, and the exact nature and importance of these advantages are most explicitly stated. The general evolution and relative merits of trolley, conduit and surface-contact tramway systems are discussed with an entire absence of bias; but in the succeeding pages it is hardly clearly enough stated that series-parallel motor control enables cars to be run at half-speed, as at full load, without loss in regulating resistances.

Those attributing the backwardness of electric traction in this country to lack of enterprise would do well to study the unexpected direct and indirect effects of the Tramways Act of 1870 and the failure of the Light Railways Act of 1896, as explained in these pages. The possibilities of the trolley-'bus are considered with well-tempered enthusiasm, the author wisely concluding that these vehicles are best employed as tramway "feeders" and "feelers," yielding place, if local conditions are favourable, to trolley tramcars. In the chapter on regenerative control it would have been well to note that mechanical brakes are required to hold a stationary car. Dealing with accumulator traction, the author does not explain clearly the developments required (and the possibility of their realisation) to make heavy accumulator vehicles practicable, nor does he show any reason why the development of the electric vehicle in America should not be imitated in England. Many of the limitations of accumulator traction are attributable to its present restricted development. Mr. Whyte might have dealt more fully with the essential part played by electrical machinery in submarines.

In the concluding chapters, electric, suburban and tube railways, and the possibilities of electric main line operation are excellently dealt with, and we have seldom seen a better lay description of the technical features of electric railways. The chapter on "Curiosities of Electric Traction" should help to decrease the number of fatuous patents filed by variously-deluded inventors.

We note a few lax expressions, but, on the whole, the phraseology is admirable, and the author is to be congratulated on an excellent "popular" treatment of a highly technical subject.

The book is intended for lay readers, but most electrical engineers would peruse the volume with interest, and not a few with profit.—R.E.N.

Arc Lamps and Accessory Apparatus. By J. H. Johnson, A.M.I.E.E. London: Constable & Co. Price 1s. 6d. net.

The object of this book is to enable contractors, wiremen, and others, to select the best type of arc lamp for a given purpose, and to arrange it correctly for the end in view. Too much is attempted in the first chapter; the fundamental laws of illumination are treated with alarming brevity; the introduction of a few diagrams and a greater subdivision of matter into paragraphs would be an improvement. The leading features of the more important types of arc lamps are well explained, and the book forms a handy reference volume, particularly when one knows it well enough to compensate for the absence of index and paragraph headings. A considerable number of practical points are dealt with in connection with each lamp, but there is no very clearly expressed advice such as the preface leads us to expect. The illustrations are mostly familiar to readers of

the technical Press; little, if any, novel information is included, and the author seems to have drawn too freely on catalogue data, and practical advantages as claimed by the makers of the various lamps. We should prefer data and information from the author's personal experience.

The chapters on steadying and protective apparatus, suspension and switchgear, and faults, are quite good. The chapter dealing with "Applications" is useful, but the bioscope notes are not likely to be of much value, since no mention is made in the earlier chapters of special bioscope arc lamps.

Quartz mercury lamps are very summarily dismissed, but the information concerning magnetite and titanium arcs is useful. It is difficult to deal satisfactorily with transforming apparatus without a single illustration.

The arrangement of the book might be improved in numerous respects. For instance, much of the information concerning the types of lamps in use (given in Chapter I), is obviously misplaced; again, a separate chapter might well be devoted to arc lamp connecting systems, power factors, and so on.

We notice a peculiar expression on page 53—that in vertical flame arc lamps a cast-iron reflector is used, "the reflecting powers of which are *by no means impaired*" by the white fume-deposits! What, exactly, are we to understand by "there is no question but that the fumes" (in the Jandus lamp) "have the effect of regenerating the arc"?

On the whole, the author compresses a great deal of information into this treatise, and the small size of the latter may excuse that lack of explanation and justification of many statements which would be unpardonable in a larger work.—R. E. N.

Original Papers on Commercial Dynamo Design. By W. L. Waters. London: Chapman & Hall, Ltd. Price 8s. 6d. net.

This book, by one of the chief engineers to the Westinghouse Electric and Manufacturing Co., differs considerably from the vast majority of books on electrical design. In fact, the author offers it as a supplement to such treatises as a series of articles written by one who is "actively engaged in practical manufacturing."

The book consists of a series of reprints of papers presented to the American Institute of Electrical Engineers, the National Electric Light Association, and so on.

The first chapter treats of commercial alternator design, and was originally read in June, 1903: some good information is given in an interesting manner. Being written some eight years ago it is naturally not quite up to date, *e.g.*, no mention is made, in dealing with turbine-driven alternators, of rotors of the non-salient pole type.

The next chapter deals with double-current generators, and is brought up to date by a short note added in December, 1910, the paper having been written in 1904. The influence of the frequency of the alternating-current side is well and clearly given; it is noteworthy that, for periodicities of the order of 50, the most satisfactory double-current generators are those driven by steam turbines. We think, however, that attention might have been called to the fact that the output of a double-current generator is limited by the heating of the armature, and by the field distortion due to the armature reaction, in the same way as in a direct-current machine or alternator, and is consequently much less than that of a converter. The essential difference between double-current generators and converters is that in the latter the direct current and the alternating current are in opposition and not in the same direction as in the former type of machine.

Following this we have an essay dealing with the predetermination of sparking in direct-current machines. A good description is given of the endeavours of early workers to produce sparkless commutation. A new method of calculating the reactance voltage is given, but the author admits that his formula does not take into account all the conditions affecting sparkless running, and says that his result must be used with considerable discretion. It is not at all probable that a formula can be arrived at which will take everything into account, and even if it could, it would be so complex as to be useless to the practical designer. After a careful examination of this method, the reviewer prefers the well-known Hobart formula.

The fourth article is devoted to rotary converters and motor-generators. The author appears to favour the installation of motor-generators where this is at all possible, in preference to rotary converters. After considerable experience, the reviewer's inclination is the other way. Absolute reliability is becoming of more and more importance, and there can be little question that a rotary converter, with its necessary transformer, is more reliable than two rotating machines. Also from a mechanical point of view, the rotary has the advantage that no transfer of mechanical energy takes place, since the torque produced by the generation of direct current and the torque produced by the alternating current are applied at the same armature bars, while in a synchronous motor-driven direct-current generator, the energy must be transmitted mechanically through the shaft. A note added to this paper in December, 1910, brings this well-written essay up to date, although no mention is made of the modern motor-converter.

Shunt and compound-wound rotary converters for railway work occupy the next paper, which was read in 1906. The arguments for and against compounding are well given, and it is clearly pointed out that the compounding actually takes place in the alternating-current lines leading from the rotary, in which an inductance is a necessity, and not in the machine itself.

The next chapter deals with induction generators for use in central stations and for other work. A description of the general characteristics of this type of machine is given, together with a considerable amount of information on the subject which is certainly not generally known. Induction generators undoubtedly suffer from the fact that they were tried in the early days of electric power stations. Their very high efficiency at high speeds, and robust character, certainly seem to indicate that they might be used a great deal more than they are. Their one great disadvantage is, of course, that they are unable to carry a lagging, idle-current load. The author suggests their use, together with a rotary converter, instead of very large direct-current turbo-generators. This suggestion is backed up very effectively by some figures obtained from tests at the Baltimore Copper-Smelting and Rolling Co.'s works. The results completely outclass those from an ordinary Corliss direct-current set.

Modern developments in single-phase alternators are next treated of. The principal difficulties met with in the design of modern high-speed turbo-alternators of large pole-pitch are, neglecting mechanical considerations, the result of the pulsating armature reaction and the stresses in the ends of the armature coils where they leave the laminated core. The pulsating armature reaction causes losses throughout the machine, often resulting in dangerous heating. The stresses on the ends of the armature coils are enormous when a short circuit occurs, and this has sometimes resulted, in the reviewer's experience, in the complete destruction of the coils. Some good photographs are given in this chapter of means that have proved satisfactory in obviating or minimising these inherent difficulties.

The next chapter deals with the much-discussed subjects of specifications and rating. Some original ideas are put forward which are well worth the attention of buyers and manufacturers of electrical machinery. There is no doubt that the tendency is to pay altogether too much attention to the figures stamped on the name plates of machines. The reviewer has seen machines running steadily and satisfactorily on loads exceeding by 100 per cent. the so-called rating of the machines. In the paragraphs dealing with the tests made by buyers of machinery, it is stated that certain tests cannot be made within 2 or 3 per cent., and that temperatures cannot be taken within 5°. The tests referred to are of course commercial tests on large machines, and the reviewer is acquainted with the inspectors of certain consulting engineers who would do well to lay this information to heart.

The final chapter deals with direct-current turbo-generators. The author again puts forward the turbo-rotary converter installation as being the best for large units. Some good information is given as to the best speeds for given outputs and voltages, and the principles of

commutator and brush gear design are thoroughly up to date. Mechanical construction, vibration, &c., are well entered into. It is a pity that similar information is not given with regard to compensating windings, commutating poles, &c. This chapter is the most modern, and, perhaps, the best in the book.

It is said that books may be divided into two classes, namely, very good and very bad. If this is so, then the volume under consideration decidedly falls under the first-named class. It is to be clearly understood that the book will be useless to beginners who wish for ideas on elementary design, but to the designer with some years of experience the book will certainly be of interest. While some of the information is quite common property, there are a considerable number of original and useful hints presented in a convincing manner. The author's style is blameless, being free from the vagueness and "Americanisms," which unfortunately mar many otherwise good American technical publications.

The book is got up in a faultless style, free from objectionable catalogue matter and illustrations, and bearing the above facts in mind, worth its price, despite the fact that it consists of 135 pages only.—H. G. S.

PROCEEDINGS OF INSTITUTIONS.

Institution of Electrical Engineers.

NEWCASTLE LOCAL SECTION.

A SPECIAL meeting was held on November 24th, with the object of giving to members of the Council an opportunity of hearing the views of local members on the proposed new Articles of Association. Mr. J. E. Kingsbury and Mr. Rowell, the secretary, were present, representing the Council, and Mr. Faraday Proctor was in the chair. A number of suggestions and questions had been forwarded by the Committee of the Council. A resolution had also been forwarded stating that in the opinion of the Committee it would have been better if the Council had issued a statement showing the whole of the alterations, instead of a statement which only showed the principal points in which the new Articles differed from the existing Articles. For instance, Clause 82 of the proposed new Articles, relating to the publication of proceedings, affected the working of the Local Sections, and was not included in the statement.

Replying to the questions, MR. KINGSBURY said that there was no urgent anxiety regarding funds. The fact was that there was not such a margin existing between income and expenditure as an institution of such standing should have. Regarding a suggestion that endeavours should be made to increase the membership, he said it was the aim of the Council to strengthen the Institution in regard to the qualifications of its members. The membership was increasing as compared with last year, but not so much as in 1906 and 1907, and far less than in 1900. The increased cost due to the change in the method of printing papers from Local Sections was practically a negligible quantity, but the printing was being carried out very much better than previously. The Council had felt that the building was of advantage to the Institution as a whole, and that it was not desirable to make a distinction between the advantages afforded to the London members and to the provincial members. In reply to a suggestion that there should be four Associate Members and two Associates on the Council, he reminded members that the Associate Members, being technical men, were in a way represented by the ordinary members of Council, whilst the Associate class was, of course, quite distinct. The amount of the examination fee had not been settled. The dissolution of a Local Section had not yet been before the Council, and he hoped that it never would.

MR. H. L. RISELEY objected to the proposed increase in the fees, as the provincial members would never get the extra value, and he could not see what great benefit they got out of the Institution at all. He quoted some figures from Mr. Hammond's statement, from which it was seen that whereas £13,000 had been expended in connection with London, only £1,600 had been expended on Local Sections. Provincial members derived no advantage from the library, &c., and were, in many cases, put to a great deal of expense in travelling considerable distances to attend the local meetings and meetings in London. When chairman of the Local Section, and therefore a member of the Council, he had to pay his travelling expenses to London. The members of the Council were invited to their annual dinner, but if it should not pay the Committee had to make it up, whereas in the balance-sheet there was a considerable item for the deficiency on the annual dinner held in London, and a sum of £242 in connection with the conversazione. He suggested that the *Journal* should be published while the subject matter was fresh.

MR. R. P. SLOAN felt strongly on the question of increased subscriptions, and thought that the time for raising subscriptions was not ripe. Serious consideration should be given to the question whether the increase in subscriptions would be detrimental to the present position of the Institution.

MR. T. W. CARTER said that the question of extra payments by those members who had compounded should be considered. He suggested that the invidious distinction between Licentiates and Associates could be got over by using the terms Technical Associate and Non-technical Associate. Very definite information should be given as to what form the examinations were to take; a system of confidential reports from employers would be a much better guide as to a man's fitness for membership.

MR. BLACKMAN (Sunderland) said that the Newcastle Local Section comprised 211 members of all classes, who, at the present rate, paid £407 8s. per annum, while the expenses of the Section amounted to £85 6s. 4d. (December, 1909). After deducting items which did not affect the Local Section, there was a balance of £126 profit made at the expense of the Newcastle Section. He was confident that there would be a heavy cessation from membership, and from mixing with the people who would be affected, he gathered that the provinces were against the proposal. The opinion appeared to be that provincial members had not sufficient opportunities to make their voice felt. At least a two-thirds majority of a public meeting should be necessary to effect the closing down of Local Sections.

MR. C. VERNIER (Newcastle E.S. Co.) thought that the incorporation of other societies should not be permissible merely at the discretion of the Council. Subscriptions should be payable at the beginning of each session, and not, as at present, at the beginning of each year. Through submitting papers to London for approval great delays occurred.

MR. C. TURNBULL (Tynemouth) asked if, in the event of the subscriptions being raised, it would be allowable for members to pass into a lower class.

MR. G. STONEY, speaking as an ex-member of the Council, thought that the increase in the subscriptions was justified. The immediate result might be a drop in membership, but the effect was temporary only. With regard to the Licentiate class, it had long been felt that some provision should be made for switchboard attendants, shift engineers, and others, who could not be Associate Members. The effect of the examinations had been excellent in the case of the Civil Engineers, and resulted in a large increase in the membership.

MR. W. C. MOUNTAIN could not agree with Mr. Stoney regarding the increase in subscriptions. If more money was required he thought that the London members should pay.

Many other members took part in the discussion.

MR. KINGSBURY, in reply, said that there could be no question but that the new buildings were required. It was hoped that as time went on an even closer relationship would grow up between London and the Local Sections, and that the latter would derive an increasing amount of benefit from the premises at headquarters. With regard to the new powers which were sought by the Council, legal opinion on this matter had been obtained, and they were advised that these powers were necessary in order to efficiently carry on the work of the Institution. For instance, if an overdraft at the bank were required, it was obvious that it should not be necessary to consult the body of Members. The expenses of the Local Sections should not be considered for individual cases, but should be treated as a whole. Their Institution cost less to run per member than any other Institution of equal standing. It was impossible to maintain the prestige of the Institution, and to do the work which was necessary, without keeping up or even increasing the expenditure. Under the rule regarding transfer, no technical Associate need have the slightest fear, as ample time would be given for transfer, and special facilities would also be given.

MR. H. L. RISELEY moved a motion to the effect that further consideration to the Council's proposal be deferred for one year, but this was lost by the casting vote of the chairman.

MANCHESTER LOCAL SECTION.

A meeting of this Section was held on November 21st, 1911, to discuss the revised Articles of Association. Mr. S. Z. de Ferranti, Mr. Robt. Hammond, Mr. Hugo Hirst, and Mr. P. F. Rowell, secretary, attended the meeting on behalf of the Council, and Mr. W. Cramp, chairman of the Local Section, took the chair.

Called upon by the CHAIRMAN, MR. HAMMOND said it might save time if he gave the assurance that on all minor points, the Council would give the fullest consideration to the suggestions of members. For instance, the Council were quite willing to refer to the members on the question of pledging the property of the Institution (Article 66), and also on the incorporation of other societies (Articles 69). Three things, however, prominently stood out:—

Subscriptions.—The Council desired to raise these in order to provide funds for new developments, not for current expenditure.

Intermediate Class.—The Council had for years found it extremely inconvenient to have no special class for students out of their time, and who had not arrived at the age of 25, the limit placed by the Articles upon the Associate Member. The Council also foresaw that the institution of examinations would cause a delay on the part of many men in entering that class, again necessitating an intermediate class; hence the Council's suggestion of the class of Licentiate, though the actual name might now be considered as withdrawn. In Leeds, preference was expressed for the word "Graduate," with possibly a limit of age of 27, so that the Graduate I.E.E. could not come into serious competition with the A.M.I.E.E.

Associates.—The provision of an intermediary class into which non-technical men could be put would very much strengthen the Associate class, and it was felt that a number of men, upon whom

the great commercial future of the industry depended, would be attracted to that class.

Election of Council.—The proposal of the Council in Article 51 was a departure from present practice, viz., that 35 members, or preferably perhaps 10 members, were empowered to select names, but it was felt that if those names were adopted by the Council the members need not be further troubled. If, however, there was a feeling that the members should still have the right to add to the Council's final list, they had only to express their wishes, and he felt quite certain that the Council would comply with them.

Mr. H. Hirst dwelt strongly upon the dignity attaching to the titles M.I.E.E. and A.M.I.E.E., which was certainly enhanced by the building. He pointed out how greatly the Council would extend the activity of the Institution, if it received more money. He explained the present work of the Textile Committee, and pointed out how useful research of this character would be if extended to other trades. It was of the highest importance to electrical engineers, and especially younger members to get into contact with their market, and this could only be largely achieved by securing the attendance at their meetings of those who would become associates in the future. The want of interest betrayed by the Institution in the past in other than scientific work, had led to various organisations being formed outside. Much of the work now organised by such associations could have been done by Committees of the Institution itself.

The Chairman explained what steps the Committee had taken. Each member of Committee had been asked to send in recommendations for alterations. The recommendations had been thoroughly discussed and reduced to a very few points. The first considered was:—

Clause 15.—*Intermediate Class.*—Recommend that the name Licentiate be not adopted, but as an alternative that the term "Engineer Associate I.E.E.," be substituted, with an abbreviation to be determined by the Council. Commercial men to be termed "Associates I.E.E."

Mr. Welbourn said the Committee of the Section were in accord with the recommendation of the Council that a new intermediate class should be formed.

After further discussion, the President said the discussion showed how great was the difficulty of naming the class. The word "Associate Member" was not rational as designating a potential member. He never liked the word "Licentiate." At first his idea was to call the non-technical members "Commercial Member" and "Commercial Associate Member." It was felt, however, that no one would care to be called a commercial member. The next idea was to retain the present classification, prefixing "Hon." to the titles of the non-technical members in each class, but the hon. treasurer was afraid that hon. members would not want to pay any subscriptions. Eventually "Licentiate" was hit upon, but the Council would be greatly indebted to those who could suggest a better word.

Votes were then taken on the questions: (1) Is the new intermediate class desirable?—Carried almost unanimously. (2) Is "Eng. Assoc.I.E.E." the best title for the class?—Defeated almost unanimously.

The next proposal considered was Clause 12 (*d*), relating to the admissions as Members of persons of eminence who had rendered important services to electrical engineering in the fields of commerce, finance, law or science.

Mr. T. L. Miller said there was no need whatever to provide that non-technical men should be elected as Members. If the Associate class were strengthened, that class would only be jeopardised by the provision that superior non-technical men should become Members.

Mr. J. Frith (vice-chairman) said that the Council had definitely withdrawn Clause 12 (*d*) by its utterances on the subject of reserving the titles of Member and Associate Member as those of engineers.

The Chairman said that the Committee felt strongly that Clause 12 (*d*) should be deleted, and that any desirable names thus excluded would be better in the class of Hon. Members.

The President said he felt that there was very good ground for the opposition to Clause 12 (*d*), but pointed out that this provision had formed part of the constitution of the Institution from the very beginning, for over 40 years; the existing Article ran:—"He shall be so prominently associated with the objects of the Institution that the Council consider his admission to membership would conduce to its interests."

The Chairman put the question to the meeting whether they desired Clause 12 (*d*) deleted, and it was carried with only one dissentient.

Clause 27 referring to subscriptions of members was next taken; the resolution of the Committee of the Section was as follows:—

Members.—(1). That London Members within a radius to be fixed pay four guineas; (2) that Members within a certain radius of a Local Section pay 3½ guineas; (3) that Members outside either of the above pay 3 guineas.

Associate Members be similarly graded thus:—(1) 3 guineas; (2) 2½ guineas; (3) 2 guineas.

Associates be similarly graded thus:—(1) 2½ guineas; (2) 2½ guineas; (3) 2 guineas.

Students.—The old rule to be substituted for the Students instead of the new one.

Mr. S. J. Watson said the Committee felt that it was right to consider the question of subscriptions from the point of view of acknowledging that it was desirable to enlarge the scope of the Institution, and to use to the full extent the advantages which the Institution possessed in its excellent building. At the same time, the Committee felt strongly that a differentiation should be made between London members, members of Local Sections, and members outside these areas. It was a mistake to make a Student pay 1½ guineas at the age of 21, and as it was vital to the Institution to have a free supply of Students, they should not check in any way the admission of Students or their continuance on the roll throughout their Studentship.

Mr. Cunliffe suggested that Associates, who were presumably men of wealth, might be called upon to pay the same subscription as Members. With regard to the proposal in the revised Articles that Members should pay 4 guineas, whether resident in London or not, this was actually higher than the subscription paid by the Members of the Institution of Civil Engineers.

Mr. H. W. Wilson thought it was a great mistake to raise the subscriptions at all; the raising of Members' subscriptions from 3 to 4 guineas would lead to many resignations.

After further discussion, the questions:—

1. Is the Institution justified in asking for more money?

2. Should the subscriptions of London members be differentiated from those in the provinces? and

3. Should members residing in the area of a Local Section pay higher rates than those outside it?

Were carried by large majorities in the affirmative.

On Article 47, providing that the Vice-Presidents should be chosen from ordinary members of Council, the recommendation of the Committee was that the word "ordinary" should be deleted, in order to make it possible that the chairmen of Local Sections, now treated as *ex-officio* members of Council, should be eligible for the high offices of the Institution.

Mr. Frith said it was a distinct slur for Chairmen of Local Sections to be debarred from being made Vice-Presidents. The Council should bear in mind that there were more electrical engineers in Lancashire than in London.

Mr. Robt. Hammond explained that the revised Articles did not debar Chairmen of Local Sections from becoming Vice-Presidents, but they provided that they could only become Vice-Presidents by being chosen as ordinary members of Council by the full members, instead of by the Local Sections.

The Chairman put the recommendation to the meeting that the word "ordinary" in Article 47 be deleted, and it was carried unanimously.

On Article 58, in which it was proposed that it should not be competent for a past chairman of a Local Section to vote at Council meetings, if his chairman were present, the recommendation of the Committee was that the word "not" be deleted.

Mr. S. L. Pearce, member of Committee, thought that this was agreed to at the conferences of Local Sections last spring.

Mr. Robt. Hammond said that he was certain Mr. Pearce was under a misapprehension, and pointed out that at the present time there were 9 provincial members out of 24 members of Council, and that to add another six would give far too great a preponderance to members of Council not elected by the Institution. The proposal would give two votes to the Dublin Section, with only some 60 members resident in Ireland. A much better plan would be to agree to some form of proportional representation of the Local Sections, say one member of Council for every 500 members.

Mr. H. W. Wilson entirely agreed with the idea of proportionate representation.

The Chairman welcomed Mr. Hammond's suggestion, but thought that he had better put the recommendation as follows:—Failing a new method of electing the Council, that the word "not" be deleted from Clause 58. This was carred by a large majority.

The Chairman said the last resolution referred to Clause 52; the method of election of the Council should be similar to that followed by the Civils and Mechanicals, and the ballot should be made by post.

Mr. S. J. Watson said that the present manner of election was at the root of the whole difficulty. Why should the Council nominate members of its own body? The people to elect the Council should be those whose interests the Council had to serve. The Council might suggest certain names and the members certain names, and finally every corporate member should have a vote.

Mr. S. L. Pearce suggested that a method of election should be adopted which differed somewhat from that of the Civils and Mechanicals, and should be an improvement upon both. He agreed with Article 51, but suggested that the list should be supported by 10 corporate members instead of 25. The procedure would then be as follows:—

Nomination of Council.

51. Prior to the 1st day of March in any year, any *ten* Corporate Members may nominate any duly qualified person or persons to fill any vacancy or vacancies about to occur in the Council on the 30th day of September next following by delievering such nomination in writing to the secretary, together with the written consent of such person or persons to accept office if elected.

52. At an ordinary meeting, at least four weeks before the annual general meeting, the Council shall present a list of persons whom they nominate for the vacancies in the offices of President, Vice-Presidents, Honorary Treasurer and ordinary Members of Council. Thereupon a ballot list containing the names of any other person or persons who has or who have been duly nominated under the provisions of Article 51, in addition to the names of those persons who have been nominated by the Council shall be forwarded to the Corporate Members and Associates of the Institution not less than seven days before the annual general meeting; it being a condition that to ensure an election for the ordinary members of Council such ballot list must contain the names of not less than nine persons for the six vacancies created annually, whether nominated by the Council or under the provisions of Clause 51.

Each Corporate Member or Associate shall be at liberty to make a selection from such list, provided that the number of names so selected shall not in any case exceed or be less than the number requisite to fill the vacancies.

Ballot papers shall be so marked, returned, counted and recorded, as may be from time to time determined by the Council. The persons elected shall take office on the 1st day of October next following their election.

No resolution was put, but the matter was left for the method of nomination and election as put forward by Mr. Pearce to be forwarded to and considered by the Council.

The PRESIDENT said he highly appreciated the splendid preparation of the work that had been done by the Committee, and he congratulated the Section on the broad-minded view which they had brought to bear on each one of the knotty points presented to them.

MANCHESTER STUDENTS' SECTION.

A number of resolutions and suggestions were placed before Mr. Hammond and Mr. Rowell at Manchester on November 22nd by the Students' Section of the Local Section.

The first resolution recorded a respectful protest against the action of the Council in attempting to bring into force, at such short notice, the proposed alterations to the Articles of Association without ascertaining the feeling of the Students, as in the case of such drastic changes as were proposed, the Students were more closely affected than other grades.

The Students' Committee suggested that in Article 13 (*a*) (Associate Members) the words, "in a responsible position," be inserted after the words, "for at least two years as an electrical engineer," and that grounds for exemption from examination should be (1) the holding of an engineering diploma or degree. (2) Being a Student who shall have obtained a Student Premium, or have had a paper or original communication accepted for printing in the *Journal*.

In Article 16 (*b*) it was proposed to include as a qualification for admission as a Student, pupilage or apprenticeship to any approved firm of electrical engineers, approved supply company, or municipal undertaking, and to delete the words "under agreement."

In Article 26 it was suggested that a candidate having been a Student, for three years should pay a maximum transfer fee, including examination fee, of one guinea.

In Article 27 it was proposed that the subscription of Associate Members on the register before December 31st, 1911, or Students on that day, should be 2½ guineas; also that all students pay 1½ guineas per annum, dependent on the amendments to Articles 26 and 68, no age limit being included with reference to subscriptions.

In Article 44 it was suggested that three delegates (non-voting) appointed by the Student Members be called in conference by the Council when matters pertaining to Students were to be discussed, and that these delegates might request the Council to put such matters on the agenda.

In Article 68 it was proposed that no examination fees be paid by Students except as per amendment to Article No. 26.

In connection with Article 84, it was proposed that the Students' Section should be local and under the direct control of the Local Senior Section, with a complete reorganisation of the Students' Section.

A resolution was passed, "That *Science Abstracts* be sent to every member along with the *Journal*.

SCOTTISH LOCAL SECTION.

A SPECIAL general meeting of the Scottish Local Section was held at Glasgow on November 24th, 1911. Mr. Sam Mavor presided, and was supported by Mr. Ferranti, President of the Institution, and Messrs. E. G. Tidd and W. W. Lackie, past chairmen of the Section.

MR. SAM MAVOR said that a great deal of the criticism of the proposed Articles of Association had been based upon disapproval of the short interval between the issue of the new proposals and the date of the meeting at which it was proposed they should be discussed. That was an unfortunate mistake, and it was unintentional on the part of the Council, which recognised that a mistake had been made, and afforded a most ample opportunity for a full discussion of the whole matter.

MR. FERRANTI said the Council had made a mistake, and they were now asking the whole membership to give them the benefit of their ideas. Electricity had passed from the stage when it was a novelty; they had now got down to the dry, practical side of the business, and there was a danger of the Institution losing interest and popularity. Along with this development of the business there had grown up multifarious interests—some of them purely technical, some of them commercial, and many of them a combination of the two. These interests were not being properly looked after and superintended, and he thought it was the duty of their Institution to do this. This meant broadening the basis of membership, so as to include the various classes of people represented by these interests. In this way the efficiency of the Institution would be greatly increased, and the practical value and use of membership would be largely enhanced. With proper organisation, electrical interests of every kind might be thoroughly attended to and electrical progress definitely promoted. As at present constituted the Institution was not fit to overtake this work. With regard to the subscriptions, there was something to be said for a graduated scale according to geographical position, but he pressed the point that they should regard the subscription as a payment made to a central body, who were organised to look after their interests and see that they were conserved. It was for the members to say whether the subscriptions should be uniform or not. On the suggestion of the chairman it was agreed to take up the points mentioned by Mr. Ferranti, seriatim, the first point considered being the proposed broadening of the basis of membership.

MR. MCWHIRTER agreed that the basis should be broadened on the lines suggested.

MR. T. C. FULTON asked if there would be any opportunity of provincial members exercising a voting power in connection with the adoption or otherwise of the amended constitution.

MR. FERRANTI was inclined to think that such voting power could not be legally granted, and that they must depend upon the Council, which included a proportion of provincial members, to carry out their recommendations.

MR. SCOTT MAXWELL said broadening the basis on the lines indicated would tend to lower the status of the commercial electrical engineer, who was the man they should seek to encourage.

MR. LACKIE supported the Council's proposal, which, he said, would add greatly to the usefulness of the Institution.

MR. E. G. TIDD said the two classes mentioned by Mr. Ferranti were quite distinct. The technical business man was eligible for Associate Membership, and therefore the proposed new class of member would not affect the status of the commercial engineer.

PROF. BAILY said that the technical commercial man might not be eligible as an Associate Member, because, according to Rule 13, the candidate for admission to this class must be a genuine engineer at the time of his election. He agreed, however, as to the desirability of getting both the purely commercial man and the technical commercial man into the Institution.

MR. J. A. ROBERTSON said the object of the proposed new class of members was to keep them distinct from the qualified technical men whose qualifications gave them a certain position in the technical world, and if they could have some guarantee that the new class would be properly distinguished, it would remove the objections of many members.

MR. FERRANTI said the only corporate members would still be Members and Associate Members. The other class would not have the word "Member" as part of their title.

MR. LEE MURRAY said that many men remained in the class of Associate who should be Associate Members. Corporate members should be confined to engineers.

On a show of hands being taken, the principle of the broadening of the basis of membership was declared unanimously agreed to.

The subject of subscriptions was then discussed. MR. MCWHIRTER said that local provincial members did not enjoy the privileges of London members, and the proposed increase in the subscriptions would hit many of their members rather hard.

MR. MAVOR said he was at first opposed to the increased subscription, but further consideration had shown him that the increase was absolutely necessary. Provincial members forgot that they had been living for 28 years on the charity of the Civils, who granted them the use of their rooms. With a membership of 6,000 that state of affairs could not be continued. Their Institution was the only one which provided Local Sections. They knew the privileges they had as Local Section members, but they must take a wider view than that. They were members of the Institution first, and of the Local Section second. From their geographical position it was simply inevitable that the management of the Institution should be almost entirely vested in the Council in London. Provincial members, perhaps, did not quite realise the amount of work that some of the London members put in on the various committees that attended to the business of the Institution at headquarters. It was a mistake to think that the headquarters in London were used as a club by London members. As a matter of fact, the buildings were used by provincial members from Birmingham, Bristol, &c., rather more than by London members. The Council were anxious to extend the usefulness of the library by making it a lending library instead of merely a reference library. Hitherto practically every reform proposed in the organisation had had to be referred to the Finance Committee, who simply negatived it for lack of funds. This was an intolerable position, and it was absolutely necessary that they should have more money at their disposal to carry on the work of the Institution.

MR. W. L. SPENCE objected to the extent of the increase.

MR. J. S. NICHOLSON said they should not be too niggardly. He was against a graduated subscription. They should all be on the same footing.

MR. BURBIDGE said that the proposed increase might have the effect of decreasing their funds. He thought that Associate Members living abroad should be treated on the same lines as full Members in similar circumstances.

MR. SCOTT MAXWELL favoured a uniform subscription.

The CHAIRMAN said that the total expenditure allocated to Local Sections amounted to 40 per cent. of their subscriptions.

PROF. BAILY said they must pay for the benefits before they could get them. The proposals in the revised constitution would raise the status of Associate Membership.

MR. FERRANTI said they had calculated to lose 10 per cent. of their members by the increased subscriptions, and they had not allowed for any revenue from the proposed new grade of member. It would pay them to have a higher subscription in order to ensure a better return for their money. Unless the Institution were really to watch and protect their interests in a practical way it would cease to be of interest to many of them. His experience of the Council was that they were most conscientious in their methods of dealing with applications for admission. Their efforts in the past had always been crippled for lack of funds, and he felt that their Institution must be made really useful or it would cease to appeal to them as being worthy of their support.

A vote was then taken :—

1. As to whether some increase in the subscription should be made. This was unanimously agreed to.

2. As to whether the subscription should be uniform or graduated—26 voted for a uniform subscription, and 12 for a differential subscription

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Yorkshire Local Section.

On November 15th the chairman, Mr. T. Harding Churton, delivered his inaugural address. Referring to the proposals of the Council to widen the borders of the Institution so as to embrace many persons, who, though not by profession electrical engineers, were interested in the application of electricity, he said that the Institution had been not infrequently regarded as a purely scientific and academic body ; but they should not forget that they depended upon trade. Electrical engineers carried on their business or profession for the purpose of making a living, and the Institution would flourish only if its members succeeded in that essential purpose. If, therefore, the advancement of the application of electrical science (to borrow the words of the Memorandum of Association) was hindered by economic or legislative causes that were capable of being reduced or removed, it seemed right that the Institution should do all that it fittingly could do to that end.

The state of unrest that had manifested itself in the unfortunate labour disputes of late, undoubtedly originated in the ambition on the part of "Labour" to participate in a larger share of the wealth produced.

The production of any commodity required first, and as a necessary antecedent, (1) capital, and (2) labour.

What was it that regulated the proportions of the produce of capital and labour employed which went to the owners of the capital and to the labourers respectively ? The relative value in exchange of anything, be it capital or labour, depended upon the law of supply and demand—its value in exchange varied inversely as the supply of it and directly as the demand for it.

In any particular part of the world, the supply of a commodity depended partly upon the total supply of the world and partly upon the facilities that existed for transferring it from other parts to that particular part of the world.

Any inequalities there might be in the value of either capital or labour in various parts of the world in consequence of local conditions of supply and demand, tended to produce a flow from those parts where the value was less to others where its value was greater, and thus to establish a condition of equilibrium.

Capital, labour, and the product of the capital and labour, each had its market value. If either the capital or the labour employed in the production of any commodity or in any particular place could find more profitable employment in the production of any other commodity or in any other place, there was a natural tendency for either to flow to such other employments or places. But the flow was sometimes slow, and equilibrium only partially preserved. Capital, for example, in the form of lands, buildings or machinery, could not always be readily adapted to another use. And a man who, after years of training, was skilled at one kind of work, could not always readily adapt himself to another kind of work of equal value in exchange.

What results would follow, or tend to follow, the "artificial" raising of the value of either capital or labour by means of combination among capitalists or labour respectively ? Taking labour first, whatever the extent of the combination, the object was to maintain, with relation to the rest of the world, a higher level of market value than that which it would possess if left to the free operation of the law of supply and demand.

If the commodity produced by the kind of labour in question was one that might be readily imported from other countries, the value of the labour in the combination would thereby and to that extent be kept in check. In other words, as supply depended (in part) upon facilities for import, and as market value depended upon supply (and demand), therefore market value depended (in part) upon facilities for import (and demand).

If outside competition kept down the market value of the commodity to such a level that when labour had been paid at its increased rate, there was less than the market value of the capital left, there would at once be a tendency for the capital to be diverted to more profitable uses. Thus, the employment in that industry in this country would decrease, and the foreign importation would increase.

A striking example, illustrative of this, came to light in August last, when a chainmaker was prosecuted under the Trade Boards Act for paying boys in his employ 12s. 6d. and 13s. per cwt. for making a particular class of chain, whereas the *minimum* legal rate was 17s. From the evidence it appeared that the market value of the chain was only 17s. per cwt., which therefore left nothing—after paying the legal rate of wages—for material or other expenses or profit. The result of such legislation must clearly be to drive the trade and employment away altogether.

The Judge of the Federal Arbitration Court of Australia some two years ago, while settling a dispute, said he could not dictate to the employers what work they should carry on. But he could and would prescribe the conditions under which they must employ men, if they chose to employ them ; and, if any industry could not afford to pay the "living wage" which the Court awarded, its remedy was to apply to the Federal Parliament for protective duties that would allow it to comply with the award. It seemed clear that by no other means could the free flow of competitive foreign labour be checked or prevented.

Another result that might be noted was that a rise in wages of one kind of labour was generally followed by a rise in other kinds of labour. One section after another succeeded in obtaining increased wages, which process tended to restore the original relative-values in exchange. The wage earner, having in consequence to pay more for his commodities, might be really no better off in the last stage than in the first. And here he might observe that they were all, as *consumers*, thereby indirectly *employers*. It was said that though, in recent years, rates of wages had been generally increased, the cost of living had increased in a still greater degree—which indicated that the demand for food-stuffs and other necessaries had increased more than the supply of the same. It would appear that this result was brought about by there being a smaller proportion of labour or capital—or of both—employed in the cultivation of food than hitherto.

With regard to combinations of capitalists, the principles that applied to labour applied also to capital. For that reason, in a country in such circumstances as this, having ample shipping communications with every part of the world, and no restrictions upon imports, the conditions for effective combination among capitalists were not favourable.

Thus the answer to the question—what was it that regulated the proportion of the produce of the capital and labour employed which went to the owners of the capital and to the labourers respectively ?—was the law of supply and demand. "Supply" was dependent upon the facility with which the commodity might be imported—and upon the degree of this facility depended the extent to which the value of either capital or labour might be locally forced up by combination of capitalists or of labour respectively.

If the supply of either Capital or Labour fell below the amount which the other could profitably utilise, the supply of the product must be diminished. And, conversely, if both the factors of production were proportionately increased, the product would also be increased. With a greater amount of produce to divide, the greater would be the amount received by the parties to the distribution. Therefore, he said : "Encourage Capital—it is necessary for employment ; encourage Labour—it is necessary to render Capital productive ; encourage the greatest possible efficiency in Production—the 'living wage' is measured by it."

Automatic Reversible Battery Boosters.

By R. Rankin, A.M.I.E.E.

(*Abstract of paper read before the* Institution of Electrical Engineers, *London, November 23rd, and Manchester, November 28th*, 1911.)

When it is considered that a saving in coal consumption of between 20 and 30 per cent. can be obtained through the installation of a battery and booster plant, in cases where the load is of a very highly fluctuating nature, and, say, 10 to 15 per cent. by the provision of a reliable automatic booster in cases where a battery is already installed without a booster, it will be seen that an exceedingly good case can be made out for this type of plant. The percentage savings given above are results obtained in actual practice.

In order to obtain the maximum economy, the battery-booster plant should equalise on the total load of the system on which it is installed. This, of course, it cannot usually do in the ordinary corporation electricity station, where the three-wire general supply system with earthed neutral has to be kept separate from the traction system with its rail return, but even when equalisation is only carried out on the traction load, which is supplied by separate main generators, striking results can be obtained. They become more marked when the traction and general supply systems can be supplied from one set of generators, being connected by a link in the form of a motor-generator. It is, however, in the case of a works generating its own electricity for lighting, and for a very highly fluctuating power load, that the economy shown by a battery-booster plant attains its maximum. An ill-regulated voltage is fatal to satisfactory illumination, and leads to short lamp lives, and a good, steady voltage is practically a necessity. There can be little doubt that proper steady illumination in a workshop makes for greater efficiency and greater output, and the general good effect on workmen of working under satisfactory conditions is a thing which very often does not receive the consideration it deserves.

The writer has had practical experience of cases where a battery has proved of immense advantage in preventing the stopping of important processes during temporary failure of the main supply. Especially where gas-driven generating plant is installed, the certainty of a standby of this sort is of great importance. Light loads at meal hours and week-ends can often be handled by a battery, when otherwise the generating plant would be kept running very inefficiently.

Seeing that the accumulators made by the leading makers have now attained a high standard of excellence, the question practically hinges on the booster, the success of this being the factor determining the success of the whole installation.

Broadly speaking, the boosters in use in this country belong to one of three classes :—

(A) Those in which the booster can be self-contained and operated by its own field windings independently of any outside controller.

(B) Those in which a so-called exciter is an absolute necessity, not merely for exciting purposes, but being an essential in the theory of the system.

(C) Those in which an external automatic regulator is used on the booster field, either indirectly or through an exciter, the latter not being an essential in the theory of the scheme.

Class (A).

Differential Booster.—The simplest type in this class is the simple differentially-wound machine shown in fig. 1. In this case a

coil A, carrying a portion of the total load current, and giving a booster voltage in the discharge direction, acts in opposition to a coil B, excited from the bus-bar voltage, and giving a field tending to produce a charge boost. The battery being assumed in a floating condition—that is, its voltage, with no current flowing

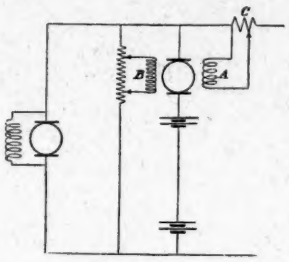

Fig. 1.

into or out of it, being just equal to the bus-bar voltage—it is evident that the battery will be idle and the generator will supply the load when the effects of coils A and B just balance each other. An increase of load will cause A to overpower B, and a resultant booster voltage in the discharge direction will be produced; the battery will accordingly come to the assistance of the generating plant, and with ideal working and the diverter C properly proportioned, the discharge current would be practically equal to the excess of line current over that at which A and B were just balanced. A decrease in line current would have an exactly opposite effect.

The battery being continually on the charge or discharge, its E.M.F. will vary considerably, as also will its resistance. For this there is no compensation, and this action renders it impossible to obtain good regulation of the load on the main generating plant.

In the Pirani booster the shunt coil B is connected across the battery. This certainly gets over the above-mentioned difficulty, but it introduces another trouble, which is quite as bad as the one eliminated, viz., that the action is unstable, and the battery tends to over-charge and over-discharge. There is no limit to this action, and the generator may be heavily overloaded, or the battery injured through getting too great a charge.

Another disadvantage which is, however, shared by other boosters of this class, is that the amount of copper in the field is excessive, since it is not the actual ampere-turns on the magnets that are effective, but the difference between the series and shunt ampere-turns.

The Crompton booster is the elementary Pirani with the addition of a shunt coil connected across the booster terminals, ostensibly to compensate for the varying state of the battery; but it is difficult to see what gain is expected by the provision of this coil, as the undesirable features of the Pirani system are always present in the system.

The Lancashire booster shown in fig. 2 is of the differential type, the booster being provided with a third coil D, connected across the booster terminals, and excited by the difference between bus-bar and battery voltages; it is designed in such a way that the field produced by it on the booster is always of such a value as to produce, in the booster armature, a voltage exactly equal to the voltage across its own terminals. Thus there is always, in the battery and booster portion of the circuit, a voltage equal to the bus-bar voltage, independent of the state of the battery. This

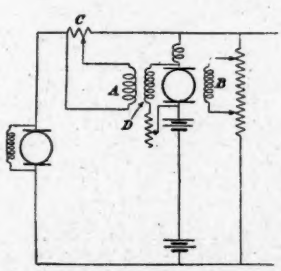

Fig. 2

leaves the coils A and B free to serve their proper purpose of regulating the booster charge and discharge, the two being balanced at normal generator load, and the total voltage in the battery-booster limb of the circuit being then equal to the floating value—*i.e.*, equal to the line voltage.

It should be observed that the diverter coil of the Lancashire booster carries a portion of the generator and not of the line current. The working of the system is as follows:—At normal desired generator load the diverter coil and the separately excited shunt coil are set to balance each other. The self-excited shunt coil supplies the difference between the battery and line voltages, enabling the battery to float without charging or discharging. An increase in line demand causes an increase in generator current, and therefore in diverter coil current, which starts the battery on discharge. The battery voltage accordingly drops, but the self-excited shunt coil compensates for this drop, the initial voltage due to the increase in generator current being available to draw current from the battery until the battery current attains the value at which the generator current returns to the normal.

In diverter boosters generally the generator current should be adjusted to the desired value by an adjustment of the shunt coil B alone. The diverter should normally not be touched, once it has been set to the proper value, although, in a Lancashire booster, both diverter and shunt regulator require to be adjusted if the best results are to be obtained.

Class (B).

The connections of the Highfield booster are shown in fig. 3. In this case the varying state of the battery is compensated for by the employment of a small exciter connected in opposition to the battery through the booster shunt coil, so that the latter is excited

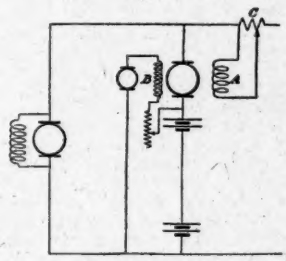

Fig. 3.

by the difference between exciter and battery voltages. The field this coil produces is of such a value as would produce a booster voltage exactly equal to the voltage across the terminals of the coil—that is, the difference between exciter and battery voltages. The diverter coil circuit being assumed open, there is, therefore, always a voltage in the battery-booster portion of the circuit equal to battery voltage plus or minus the difference between battery and exciter voltages—that is to say, a voltage equal to the exciter voltage. The state of the battery when in a normal stable working condition is therefore compensated for.

The facts that the exciter is a constant-voltage machine, and that the booster shunt coil gives a booster voltage equal to the difference between battery and exciter voltages, make it possible to run the battery and booster alone on the load, and yet have a constant line voltage automatically provided. Compounding over the steady value, if desired, can be obtained *viâ* the diverter.

With the circuit of the diverter coil closed, its additional voltage effect always tends to give a voltage in the discharge direction, since the direction of the line current is constant. With proper adjustment a rise of line current will cause an increase in diverter boost, until a discharge current is flowing approximately equal in value to the increase in line current. Similarly a decrease of line current will cause the diverter boost to decrease by an amount sufficient to allow a charging current to pass into the battery approximately equal to the fall in line current.

The scheme due to Strang, and worked by the Electric Construction Co., is another application of the principle adopted in the Highfield booster. In this, and in the Highfield system, the main point gained is that a voltage is always available and present in the battery-booster limb of the circuit, equal in value to bus-bar voltage minus diverter boost at the current which it is desired that the main generator should take.

There is one disadvantage common to all diverter boosts, viz., they will not work so satisfactorily with over-compounded generators unless arrangements can be made to over-compound simultaneously both booster and generator to the same extent—not an easy matter—and this militates against their successful employment in stations where such generators are employed.

As, however, the object of a booster is to keep a constant load on the generating plant there is little reason, provided the booster is otherwise capable of giving satisfactory results, why the generators should not be run shunt, or with some of the compounding cut out, so as to make them level-compounded while the booster is in operation. The compounding can be used, if desired, when the generator is running alone on the load. Compounding where a diverter booster is employed, if absolutely necessary, could be obtained by the use of an ordinary series line booster.

The fact that the resistance of the battery is not constant, even with the battery in a stable working condition, but varies with the varying state of the cells, is one reason why the working of line diverter boosters can never be truly accurate. Variable resistance of field coils with heating is another cause of inaccuracy of working. Besides the foregoing, the use of a diverter, itself practically non-inductive, in parallel with a highly inductive field coil, must produce a pronounced tendency to sluggishness of action in all boosters in this class.

(To be concluded.)

NEW ELECTRICAL PROPOSALS FOR PARLIAMENT TO CONSIDER.

WE give below, in our usual form, particulars of the applications that have been lodged for the consideration of Parliament and the Board of Trade early next year. Readers who require the full details of any individual proposal will find them set out in the last few issues of the *London Gazette* :—

(*a*) Electric Light and Power.

Abercarn.—Application by U.D.C. to amend 1906 order, extend time, and provide for transfer.

Abingdon.—Corporation is applying for a prov. order. Transfer powers.

Altrincham and Bowdon.—Altrincham Electric Supply, Ltd., seeks power to supply within Hale urban district and Bucklow rural district.

Annfield Plain.—A. P. and District Gas Co. is applying for power to impose a minimum charge for gas where electricity is also supplied.

Ardsley.—Application by the Electrical Distribution of Yorkshire, Ltd., for a prov. order.

Aylesbury.—Application by U.D.C. for a prov. order. Transfer powers.

Bingley.—Application by the U.D.C. for a prov. order. Transfer powers.

Birstall.—U.D.C. is applying for amendment of 1901 prov. order, extension of time, and transfer powers.

Bognor.—Application by Mr W. Tate, of Tower House, Felpham, for a prov. order.

Bognor.—Power to Bognor Gas Light and Coke Co. to establish electricity works and supply electricity within the gas limits. Supply of electricity in bulk.

Bordon and District Gas Co.—New company to take over East Hants Gas Co., Ltd. Power to apply for electric lighting order.

Burnham.—Application by U.D.C. for prov. order for Burnham district and part of the parishes of Berrow and Brent Knoll.

Burnley.—Application by Corporation for extension of supply powers to Reedley Hallows.

Cheltenham.—Application by Corporation to extend its area of supply to include parts of the Cheltenham and Winchcombe rural districts. Sale, hire, fixing, &c., of electrical apparatus.

Darton and District.—Application by the Electrical Distribution of Yorkshire, Ltd., for a prov. order for supply in Darton and Cawthorne.

Doncaster.—Corporation seeks extension of powers so as to supply in Wheatley urban district.

Dorchester.—Application for a prov. order by Messrs. J. & W. Purves.

Glastonbury.—Corporation is applying for a prov. order.

Goole.—Application by Mr. J. W. Speight, of St. Anne's-on-the-Sea, for a prov. order.

Goole and District.—Application by the Electrical Distribution of Yorkshire, Ltd., for prov. order to supply in Goole urban district, and the townships of Rawcliffe, Airmyn and Hook, in the rural district.

Great Harwood.—Application by U.D.C. for prov. order. Transfer powers.

Greetland.—Application by U.D.C. for electric supply powers. Power to transfer to Electrical Distribution of Yorkshire, Ltd.

Houghton-le-Spring.—H.-le-S. District Gas Co. is applying for power to apply for prov. order for electric lighting.

Holmfirth.—The U.D.C. is applying for a prov. order for supply in Holmfirth, Netherong, and Honley.

Hoyland Nether and District.—Application by the Electrical Distribution of Yorkshire, Ltd., for a prov. order for supply in Hoyland Nether, Wombwell and Worsborough, in the West Riding of Yorkshire.

Ilkley.—Application by U.D.C. for prov. order to supply electricity in Ilkley District and Middleton Parish.

Launceston.—Application by Launceston and District Electric Supply Co., Ltd., for prov. order to supply in borough of Dunheved, otherwise Launceston, Cornwall,

Leatherhead Gas and Lighting Co.—Various powers including permission to make a minimum charge for gas to persons who have a separate supply of gas or electrical energy for lighting, power or other purposes, but who require continuance of the company's gas supply.

Llanelly.—Application by Llanelly and District Electric Lighting and Traction Co., Ltd., for extension of limits of supply so as to include Barry Port urban district, and portions of Pembrey Llanelly Rural and Llangennech.

Newton-in-Makerfield.—Application by the U.D.C. for a prov. order. Transfer powers.

Pontefract.—Corporation seeks amendment of 1907 order, extension of time, transfer to Yorkshire (West Riding) Electric Tramways Co., Ltd.

Radcliffe.—Lancashire Electric Supply Co. seeks powers to supply in Radcliffe.

Rothwell and District.—Prov. order applied for by Electrical Distribution of Yorkshire, Ltd.

Rushden.—Application by F. H. Thornton, B. Sampson and J. Clark for a prov. order to supply electricity in Rushden urban district, Higham Ferrars, Irthlingborough urban district, Wellingborough rural district, and Chelveston-cum-Caldecott parish.

Sherborne.—Messrs. J. and W. Purves are applying for a prov. order. Transfer powers.

Sidmouth.—Supply of gas and electricity by U.D.C. Transfer to Council of Sidmouth Gas and Electricity Co.'s undertaking. Extension of time for electricity works.

Tendring Hundred Water and Gas.—In seeking powers for extension of water and gas supply areas the Tendring Hundred Waterworks Co. is, like a number of other gas companies, applying for many provisions including one enabling them to regulate prices for gas to consumers having their own separate supply of gas or electricity.

Wath-upon-Dearne.—Prov. order applied for by Electrical Distribution of Yorkshire, Ltd.

Wimborne and District.—Application by the Bournemouth and Poole Electricity Supply Co. for amendment of Wimborne and district order of 1905. Extension of time and transfer powers.

The National Electric Construction Co., Ltd., is applying for leave to bring in a Bill confirming certain agreements relating to the supply of electric wires and fittings, made between the company or its predecessors, and a number of municipal corporations and two companies. The provisions sought will require local authorities to make a charge for electric lines and fittings supplied by the companies where no obligation to charge at present exists.

(*b*) Electric Tramway and Railless Trolley Vehicles.

Bingley.—U.D.C. is applying for tramway powers.

Birmingham.—Corporation seeks further tramway powers and authority to run trolley vehicles within and without the city. Powers respecting site in Aston and Erdington for new generating station.

Brighton.—Corporation seeks powers to run electric railless trolley vehicles within and without the borough ; also powers to Hove Corporation as to working such a system in Hove ; extension of electric supply area.

Brighton District.—Powers are sought for the B.E.T. to transfer the existing tramways between Hove and Shoreham to a new company.

Brighton, Hove and District.—Brighton, Hove and Preston United Omnibus Co., Ltd., seeks powers to provide and run electric railless trolley cars in Brighton, Hove, Worthing, Portslade, Shoreham-by-Sea, Southwick, Steyning West and East ; power to run over and use portions of the Brighton Corporation tramways system ; also to purchase the Hove, Worthing and District Tramways undertaking of the B.E.T. Co., Ltd.

Dewsbury.—Corporation is seeking tramway powers.

Dover.—Corporation. Tramways extension.

Hove.—Power to Corporation to use electric trolley vehicles within the borough, and in Portslade-by-Sea, Southwick and Shoreham-by-Sea. Extension of Hove (Aldrington) electric lighting order, 1898, to above districts.

Keighley.—Corporation seeks powers to run electric trolley vehicles. Also authority to apply to B. of T. for powers to extend to routes not now specified. Various electricity supply powers, including selling, hiring, setting up, repairing, &c., electrical apparatus on consumers' premises.

Kingston-upon-Hull.—Corporation seeks powers to run new specified tramways.

London.—The L.C.C. is applying for powers to run further tramways, and to run coupled and trailer cars, &c.

London United Tramways, Ltd.—Extension of time for authorised tramways.

Metropolitan Electric Tramways, Ltd.—New electric tramways in boroughs of Stoke Newington and Hornsey.

North Ormesby, South Bank, Normanby and Grangetown.—New company to run railless trolley cars in districts named. Supply of electricity to be taken from Cleveland and Durham County E.P. Co., Bolckow, Vaughan & Co., Ltd., or other authority.

Preston, Chorley and Horwich.—P.C. and H. Tramways Co. seeks extension of time for completion of works.

Ramsbottom.—U.D.C. is seeking powers for railless electric traction in Ramsbottom ; conversion of railless traction into tramways, and incidental provisions.

Sheffield.—Corporation. New tramways and trackless trolley system. Also various powers regarding the conduct of the electric supply department.

Southall, Hounslow and Twickenham.—New company seeks powers to run railless electric trolley vehicles in Southall-Norwood, Heston and Isleworth, and Twickenham.

Stockport.—Corporation seeks power to provide and run railless electric trolley vehicles on specified route.

Swansea.—Corporation seeks powers for several new tramways. Agreements with the Swansea Improvements and Tramways Co.

West Ham.—Power to Corporation to run tramways and trolley vehicles in Wanstead and Leyton urban districts, and trolley vehicle system in West Ham county borough. Various electricity supply provisions, including supply to consumers in Wanstead and in bulk to Wanstead U.D.C.

(*c*) Railways.

L. and N.W. Railway Co.—Powers to adapt for electrification the North London and certain portions of the North and South-Western Junction and London and South-Western Railways. Agreements with owners of those railways and Metropolitan District Railway and London Electric Railway Companies as to supply of electricity ; powers to supply electricity to manufactories and works near to railway, with consent of undertakers.

Canvey Deep-Water Wharf and Railway.—New company to construct wharf, railways, &c., on the Thames at Canvey Island; powers to work railways by steam or electricity; lands for generating station; supply in bulk or otherwise to consumers whose lands abut upon lands held by the company.

Great Eastern Railway Co.—Electrification of East London Railway, and powers to various railway companies and joint committee of the East London in connection with such electrification. Powers to Metropolitan District and London Electric Railway Companies in reference to supply of electricity therefor.

London Electric Railways Co.—New railways, stairway, subways and works. Power to this company and to District Railway Co. to supply electricity to North Metropolitan E.P.S. Co. and to Richmond (Surrey) E.L. and P. Co., Ltd.

Metropolitan District Railway Co.—Widening of Wimbledon and Fulham railway, and various other works. Power to supply electricity to companies mentioned in London Electric Railway Co.'s notice above.

Metropolitan Railway Co.—Widening of existing, and construction of new, electric railways in London and Middlesex (Hammersmith, Rickmansworth, Watford).

Midland Railway Co.—Purchase of London, Tilbury and Southend Railway.

TRADE STATISTICS OF BULGARIA.

The following figures of the imports of electrical and similar goods into Bulgaria in 1910 are taken from the recently issued trade statistics; the figures for 1909 are added for purposes of comparison, and notes of any increases or decreases are given:—

	1909. Francs.	1910. Francs.	Increase or decrease. Francs.
Iron wire and cable.—			
From Austria	135,000	224,000	+ 89,000
„ Great Britain ...	27,000	15,000	— 12,000
„ Germany	168,000	205,000	+ 37,000
„ Other countries ...	15,000	36,000	+ 21,000
Total ...	345,000	480,000	+ 135,000
Rails, &c.—			
From Austria	111,000	64,000	— 47,000
„ Great Britain ...	1,044,000	348,000	— 696,000
„ Belgium	1,723,000	2,497,000	+ 764,000
„ Germany	329,000	162,000	— 157,000
„ Russia	—	658,000	+ 658,000
„ Other countries ...	2,000	48,000	+ 46,000
Total ...	3,209,000	3,777,000	+ 568,000
Copper in sheets, bars, &c.—			
From Austria	351,000	475,000	+ 124,000
„ Great Britain ...	398,000	315,000	— 83,000
„ Germany	84,000	112,000	+ 28,000
„ Russia	14,000	147,000	+ 133,000
„ France	121,000	79,000	— 42,000
„ Other countries ...	—	8,000	+ 8,000
Total ...	968,000	1,136,000	+ 168,000
Railway carriages of all kinds.—			
From Austria	550,000	443,000	— 107,000
„ Belgium	34,000	634,000	+ 600,000
„ Germany	1,947,000	2,111,000	+ 164,000
Total ...	2,531,000	3,188,000	+ 657,000
Locomotives and locomobiles.—			
From Austria	377,000	667,000	+ 290,000
„ Great Britain ...	333,000	149,000	— 184,000
„ Germany	2,853,000	1,421,000	—1,432,000
„ Other countries ...	57,000	206,000	+ 149,000
Total ...	3,620,000	2,443,000	—1,177,000
Instruments: astronomical, physical, &c.—			
From Austria	95,000	77,000	— 18,000
„ Great Britain ...	1,000	27,000	+ 26,000
„ Germany	120,000	193,000	+ 73,000
„ France	27,000	27,000	—
„ Other countries ...	10,000	11,000	+ 1,000
Total ...	253,000	335,000	+ 82,000
Electrical apparatus of all kinds.—			
From Austria	98,000	119,000	+ 21,000
„ Great Britain ...	1,000	11,000	+ 10,000
„ Belgium	11,000	16,000	+ 5,000
„ Germany	81,000	141,000	+ 60,000
„ France	61,000	10,000	— 51,000
„ Switzerland ...	12,000	23,000	+ 11,000
„ Other countries ...	1,000	6,000	+ 5,000
Total ...	265,000	326,000	+ 61,000
Machinery and apparatus not mentioned (excluding agricultural, sewing, knitting, &c.).—			
From Austria	934,000	1,313,000	+ 379,000
„ Great Britain ...	1,279,000	868,000	— 411,000
„ Belgium	255,000	305,000	+ 50,000
„ Germany	2,781,000	3,709,000	+ 928,000
„ Italy	18,000	23,000	+ 5,000
„ United States ...	58,000	50,000	— 8,000
„ France	191,000	187,000	— 4,000
„ Holland	189,000	4,000	— 185,000
„ Switzerland ...	16,000	56,000	+ 40,000
„ Other countries ...	92,000	134,000	+ 42,000
Total ...	5,813,000	6,649,000	+ 836,000

Note: 25 francs = £1.

FOREIGN AND COLONIAL TARIFFS ON ELECTRICAL GOODS.

Additions and Amendments.

BULGARIA.—The British Consul in Sofia has recently reported on the necessity for complying with the Bulgarian Customs Regulations in the case of all consignments, and calls attention to the penalties for non-observance. He writes as follows:—

Frequent complaints are heard on the part of British importers against the treatment of their goods by the Bulgarian Customs authorities, and it is important that the regulations in force should be clearly understood.

Articles wrongly declared pay not only the higher duty, but are subject to a fine equal to the duty imposed.

If the importer has the slightest doubts as to what tariff number his goods will fall under, he may make matters sure beforehand by sending a sample to the Customs department of the Ministry of Finance, with a request that it should be examined by the expert Commission and its true denomination fixed for him. Where chemical analysis is required a fee of £1 is demanded.

In cases where goods are held by the Customs to be wrongly declared, a protest on behalf of the buyer may be inserted in the Customs declaration, which is submitted to the Customs department of the Ministry of Finance. The goods in the meanwhile may either be left in the Customs warehouses, or withdrawn by the buyer, who must then deposit a sealed sample of his wares, and the amount of the extra duty and fine, with the Customs authorities. If the decision of the Ministry of Finance is unfavourable to the buyer, he may, within a period of 30 days, and on depositing a sum of 5 or 10 per cent. of the fine imposed (according to the amount of the latter), make a further appeal to the Ministry of Finance for his case to be submitted to the Revisionary Commission. If the decision of the latter is again unfavourable, the deposit is forfeited and no further appeal is admitted.

It may be mentioned that the custom prevalent in commercial circles, as between buyer and seller, is that the party who is responsible for the false declaration, whether made intentionally or not, is responsible also for the resulting loss.

NEW ZEALAND.—The Supreme Court of New Zealand has recently given an important decision as to the legal valuation of goods for import duty, in a test case brought by the Dominion Government relative to the value of goods on which duty is payable when imported from the United Kingdom into the Dominion. The questions raised in the case were:—

1. Whether, if the price of goods advanced between the time at which they were purchased in England and the time they were actually shipped from there to New Zealand, the duty payable on such was to be assessed on the invoice value, or on the value as at the advanced price, and

2. Whether the Customs authorities, having assessed and collected duty on goods cleared at the invoice value, were entitled to make a further assessment of duty in respect of such goods.

The Chief Justice, in his judgment, stated that the first question turned upon the true interpretation of Sec. 55 of the Customs Laws Act, which reads as follows:—"Whereon duty on imported goods is imposed *ad valorem*, or according to the true and real value of such goods, such value shall be understood to be the fair market value thereof when sold for home consumption in the principal markets of the country whence and at the time when the same were exported."

In his opinion, the plain meaning of the words "at the time when the same were exported" was at the time when the vessel took the goods away from the place of export. He was further of opinion that there is power to sue for Customs duties as a debt due by the importer, and that, as the duties became a debt by the importer to the Crown, the acceptance of less than the amount could not be held as accord and satisfaction, because there was no power in the Collector of Customs to vary the duty by accepting less than the legal amount. The questions put in the case were, therefore, answered in favour of the Minister for Customs.

RUSSIA.—The Minister of Commerce has submitted to the Duma a series of Bills for the revision of the Russian Customs Regulations. These Bills provide, amongst other things, for the abolition of the distribution amongst Customs employés of the proceeds of fines imposed on importers for non-compliance with the Customs Regulations, &c. Another important provision is that in invoices goods may be described by their trade designation only, and the weight of the goods may be given gross or net, the quantity of the goods to be indicated in terms corresponding with those adopted in the trade. Invoices and specifications are to be accepted not only from offices of manufacturers and factories, but also from offices of commission agents and from all kinds of warehouses, and in the absence of the shipper's signature the receiver may sign.

SOUTH AFRICA.—The Customs authorities have recently decided that drain boxes of British origin for tram rails are to be admitted free of duty.

FRANCE.—The French Customs authorities have recently decided that wires of nickel, pure or alloyed, flattened and tubulated, specially prepared for incandescent electric lamps, shall be dutiable as incandescent lamps without mountings at the rate of 7 fr. per kilog. (franc = 9·6d., kilog = 2·204 lb.)

NEW PATENTS APPLIED FOR, 1911.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by MESSRS. W. P. THOMPSON & Co., Electrical Patent Agents, 285, High Holborn, London, W.C., and at Liverpool and Bradford, to whom all inquiries should be addressed.

25,862. "Method and furnace for reduction or smelting of ore with electric current." AKTIEBOLAGET ELEKTROMETALL. (Convention date, November 25th, 1910, Sweden.) November 20th. (Complete.)

25,880. "Interrupter for electric circuits." R. BOSCH (firm of). (Convention date, June 18th, 1911, Germany.) November 20th. (Complete.)

25,890. "Electric furnace." G. METTLER. November 20th. (Complete.)

25,897. "Transmission of telegraphic messages." B. D. MORAY. November 20th.

25,899. "Arc lamps." H. WEISS. November 20th.

25,905. "Thermo-electric piles or generators." SIR J. W. SWAN. November 20th.

25,916. "Electrodes for arc lamps." H. BECK. November 20th.

25,929. "Electric switches." H. D. THOMAS. November 20th.

25,947. "Sparking plug with removable electrode and central telescoping electrode." A. L. CADE. November 21st. (Complete.)

25,965. "Telephone systems." S. G. BROWN. November 21st.

26,014. "Vehicle lamp for the simultaneous use of an electric light and an oil or other burner." CORBY HURFORD. November 21st. (Complete.)

26,021. "Fixing an electric generator in the frame of a windmill." J. A. LEEMING. November 21st.

26,089. "Type printing telegraph apparatus for line-telegraphy and radio-telegraphy having an arrangement for producing secret signal characters." AKTIESELSKABET HOVLANDS RADIOTELEGRAF. (Convention date, November 21st, 1910, Norway.) November 21st. (Complete.)

26,061. "Automatic adjustable electrical switch." J. G. BRAZENDALE. November 22nd.

26,087. "Electric lamp." E. A. WILSON and M. G. WILSON. November 22nd.

26,101. "Means for the electric heating of ovens and other appliances." C. W. MARTIN. (Convention date, December 5th, 1910, New Zealand.) November 22nd. (Complete.)

26,111. "Electric clutch for controlling railway signals." A. H. JOHNSON and W. J. THOROWGOOD. November 22nd.

26,118. "Electric switches." BRITISH THOMSON-HOUSTON CO., LTD., and E. GARTON. November 22nd.

26,119. "Voltage regulating systems." BRITISH THOMSON-HOUSTON CO., LTD., and E. GARTON. November 22nd.

26,124. "Sparking plug." C. LIRONS. November 22nd.

26,153. "Switches for high tension electrical currents." MARCONI'S WIRELESS TELEGRAPH CO., LTD. (W. S. Entwistle, Italy.) November 22nd.

26,168. "Electric clocks." H. W. LAKE. (Electro Clock Co., United States.) November 22nd. (Complete.)

26,190. "Apparatus for electrically-starting internal explosive engines." R. F. HALL. November 23rd.

26,213. "Electric dynamos." F. B. LODGE and A. M. LODGE (trading as Lodge Bros. & Co.). November 23rd.

26,245. "Electric switches." SIEMENS BROS. DYNAMO WORKS, LTD., and J. F. CROWLEY. November 23rd.

26,266. "Electrodes for flame arc lamps." F. M. LEWIS. November 23rd.

26,267. "Compositions or chemical mixtures for electrodes for flame arc lamps." OLIVER ARC LAMP, LTD., and C. OLIVER and W. M. D. PELL. November 23rd.

26,291. "Pawls of electric controller." S. SMITH, A. FLEMING and T. GUERIN. November 24th.

26,296. "Telephone cabinet to ensure privacy of conversation." J. J. WEBB. November 24th.

26,341. "Electric locking devices and locks." G. SAHMER. (Addition to No. 15,991/09.) November 24th. (Complete.)

26,371. "Process for carrying out gas reactions in an electric furnace." A. HELFENSTEIN. (Convention date, November 26th, 1910, Austria.) November 25th. (Complete.)

26,370. "Holders for electric lamps." I. FRANKENBURG & SONS, LTD., and E. FLEMING. November 25th.

26,377. "Fittings for incandescent electric lamps applicable for other purposes." F. GUNN and W. T. NICHOLSON AND CLIPPER CO., LTD. November 25th.

26,379. "Method of recarburising in electric furnaces." O. FRICK. November 25th.

26,380. "Electric arc furnaces." O. FRICK. November 25th.

26,381. "Method of electric reduction of oxides." O. FRICK. November 25th.

26,382. "Electric reduction furnaces." O. FRICK. November 25th.

26,383. "Electric lighting." I. FRANKENBURG & SONS, LTD., and E. FLEMING. (Addition to 28,724, 1910.) November 25th.

26,408. "Electrically-operated motor vehicles." CROMPTON & CO., LTD., J. C. MACFARLANE and H. BURGE. November 25th.

PUBLISHED SPECIFICATIONS.

Copies of any of the Specifications in the following list may be obtained of MESSRS. W. P. THOMPSON & Co., 285, High Holborn, W.C., and at Liverpool and Bradford; price, post free, 9d. (in stamps).

1910.

ELECTRIC ARC LAMPS. Ges. für Maschinen und Metallindustrie. 22,841. October 3rd. (October 2nd, 1909.)

ELECTRICALLY-OPERATED TIME SWITCHES OR TIME MECHANISMS. McCaffery and C. H. Klyne. 25,906. November 8th. (Cognate application, No. 10,867 of 1911.)

ELECTRICAL CONNECTION DEVICES. A. Muirhead and F. E. Wilkins. 26,077. November 9th.

CIRCUIT AND DEVICE FOR OPERATING SELECTORS IN AUTOMATIC TELEPHONE EXCHANGES. Telephon Apparat Fabrik E. Zwietusch & Co. Ges. 26,079. November 9th.

ELECTRIC CURRENT GENERATORS. M. Breslauer. 26,187. November 10th. (November 26th, 1909.)

ELECTRIC CURRENT CONTROLLING DEVICES OR SWITCHES. W. K. L. Dickson. 26,248. November 11th.

MERCURY CONTACT BREAKERS. Reiniger, Gebbert & Schall Akt.-Ges. 26,341. November 12th. (November 12th, 1909.)

DEVICES FOR CONTROLLING THE SPEED OF ELECTRIC MOTORS. Adams Manfg. Co. (Cutler-Hammer Manfg. Co.) 26,489. November 14th. (Addition to No. 13,406 of 1910.)

ELECTRIC BATTERIES ESPECIALLY ADAPTED FOR TRAIN LIGHTING. E. J. Clark. 26,542. November 15th.

ELECTRIC INCANDESCENT LAMPS. E. R. Grote. 26,667. November 16th.

ELECTRIC IGNITION APPARATUS OF MOTOR VEHICLES AND THE LIKE. G. Forster. 27,256. November 23rd.

APPARATUS FOR THE PURIFICATION OF ELECTROLYTIC GASES. A. E. Knowles. 27,264. November 23rd.

ELECTRICALLY-HEATED RADIATORS FOR HEATING RAILWAY COACHES AND OTHER PLACES. A. Craven. 29,291. December 16th.

TROLLEY HEADS FOR THE COLLECTORS OF ELECTRIC RAILWAY CARS. R. D. Blackstone. 30,240. December 30th.

1911.

DEVICE FOR STARTING INTERNAL-COMBUSTION MOTORS HAVING MAGNETO IGNITION. Firm of Robert Bosch. 18,082. August 9th. (October 1st, 1910.)

ELECTRICAL TRANSFORMERS. E. Haefely. 20,523. September 16th.

TELEPHONE SWITCHBOARDS. W. Aitken and British Insulated and Helsby Cables, Ltd. 1,110. January 16th. (Addition to No. 1,050 of 1910. Cognate application, No. 9,492 of 1911.)

ELECTRIC MOTORS AND PUMPS. W. R. Macdonald. 4,287. February 20th. (Cognate application, No. 5,612 of 1911.)

AUTOMATIC ELECTRIC REGULATORS PARTICULARLY APPLICABLE TO LIGHTING CIRCUITS. W. E. Lake. (United States Light and Heating Co.) 5,499. March 4th.

GALVANIC BATTERIES. Elektricitäts Akt.-Ges. Hydrawerk. 6,664. March 16th. (June 23rd, 1910.)

MACHINES FOR MAKING THE JOINT BETWEEN THE FILAMENT SUPPORT AND THE LAMP BULB IN INCANDESCENT ELECTRIC LAMPS. J. Barrollier. 7,868. March 29th. (March 29th, 1910.)

PROCESSES AND APPARATUS FOR MAGNETICALLY-OPERATED MATERIALS. S. Bruck. 11,898. May 17th. (May 17th, 1910.)

FIRE ALARMS. Soc. Anon. "Le Detective." 12,450. May 23rd. (May 23rd, 1910.)

TELEPHONE AND OTHER MOUTHPIECES. L. Steinberger. 14,590. June 20th. (August 6th, 1910.)

APPARATUS FOR STERILISING LIQUIDS BY MEANS OF ULTRA-VIOLET RAYS. Soc. Anon. Française dite Banque du Radium. 14,912. June 26th. (June 27th, 1910.)

CURRENT DISTRIBUTORS FOR POWER LOOMS HAVING ELECTRICAL STOPPING AND SIGNALLING DEVICES. E. C. R. Marks. (Spinnerei & Weberei Steinen Akt.-Ges.) 15,798. July 7th.

INTERRUPTER FOR THE ELECTRIC IGNITION OF INTERNAL-COMBUSTION ENGINES. Firm of Robert Bosch. 18,083. August 9th. (April 10th, 1911.)

Liberty and Property Defence League.—At a meeting of the Council of the Liberty and Property Defence League, held at Westminster, Sir Richard Temple, Bart. (deputy-chairman) in the chair, resolutions were adopted:—

1. Expressing satisfaction at the progress of the agitation for the amendment of the law relating to picketing, and urging employers to ensure the protection of themselves and their loyal workpeople by joining the Emergency Service Department of the League, and thus, in case of need, have at their command a force of special police to enable them to resist legalised aggression.

2. That Clause 64 of the National Insurance Bill should either be struck out, or amended to provide that unless a tenant gives notice to his landlord immediately he is in receipt of sick relief, the landlord shall not be restricted in the exercise of his legal rights.

3. That the League should circulate a memorandum showing that the increased cost of living is largely due to State tinkering with the conditions of life and industry, that "Social Reform" is an invention of the politician on the hunt for votes, and is a political luxury for which the lower middle and the working classes have to pay by the ever-increasing cost of all the necessities of life.

Lightning in the Transvaal.—Official statistics show that the rate of mortality from lightning in the Transvaal is far greater than in European countries or the United States, the deaths averaging over 12 whites and 40 blacks per annum. The rate works out, approximately, at 42 per million per annum for the Transvaal, while in England it is only 1 per million, in Belgium 2, in France 3, in Germany 4·5, in U.S.A. 8, and in the Austrian Tyrol 10·6.